BETTY FORD TAKES A BOW P. 14 • DARWIN WINS P. 86

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A kryptonite-green cloud fills the top of the chamber; at the bottom are 16 button-size disks, each one glowing a hazy pink. "Doesn't look like anything, right?" Robert Linares says. "But they will be half-caraters in a few weeks."

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Great white sharks aren't the mindless killing machines of myth and movie. Scientists say they're curious, surprisingly intelligent—even playful
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One hundred fifty years ago, the U.S. Army and rebellious Mormon settlers nearly came to blows. The conflict's repercussions linger still
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A pharaoh's sarcophagus. Fungus from Sumatra. A Rembrandt masterpiece. You can find them all in Europe's house museums
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To create his haunting portraits of American life, the fine arts photographer pulls out all the stops
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76 Montague the Magnificent
The charismatic muscleman won over 1930s Hollywood by hitting a golf ball like nobody's business. Then his famous friends learned why his past was also nobody's business
BY LEIGH MONTVILLE

ON THE COVER **A great white shark feeds in the clear water off Guadalupe Island near Baja California.**

PHOTOGRAPH BY BRANDON COLE

THIS PAGE **At the Naval Research Lab in Washington, D.C., diamonds are made in vacuum chambers. The crystals are being tested as biological weapons sensors.**

PHOTOGRAPH BY MAX AGUILERA-HELLWEG

Smithsonian departments

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French naturalist Jean-Baptiste Lamarck is ridiculed to this day for suggesting that giraffes got their longer necks basically by *wanting* them. But his was the first real theory of evolution.

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White House photographer David Hume Kennerly captures Betty Ford in a mischievous moment on her final day as first lady, January 19, 1977
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ON THE ORIGIN OF A THEORY
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MOSES AT THE BAT

After years of studying barnacles, Charles Darwin was able to explain how giraffes (this one's in Kenya) evolved to have long necks.

AGE FOTOSTOCK

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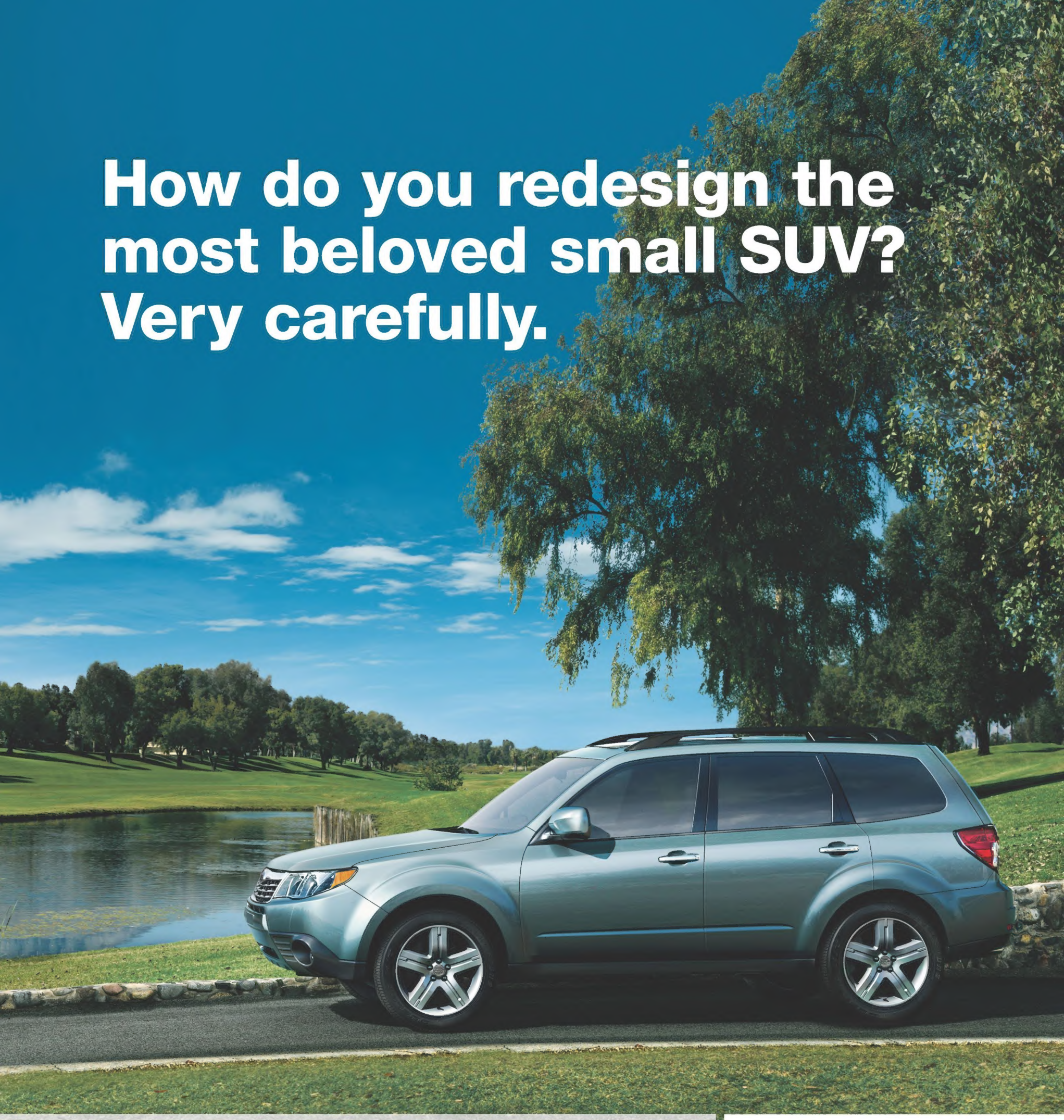

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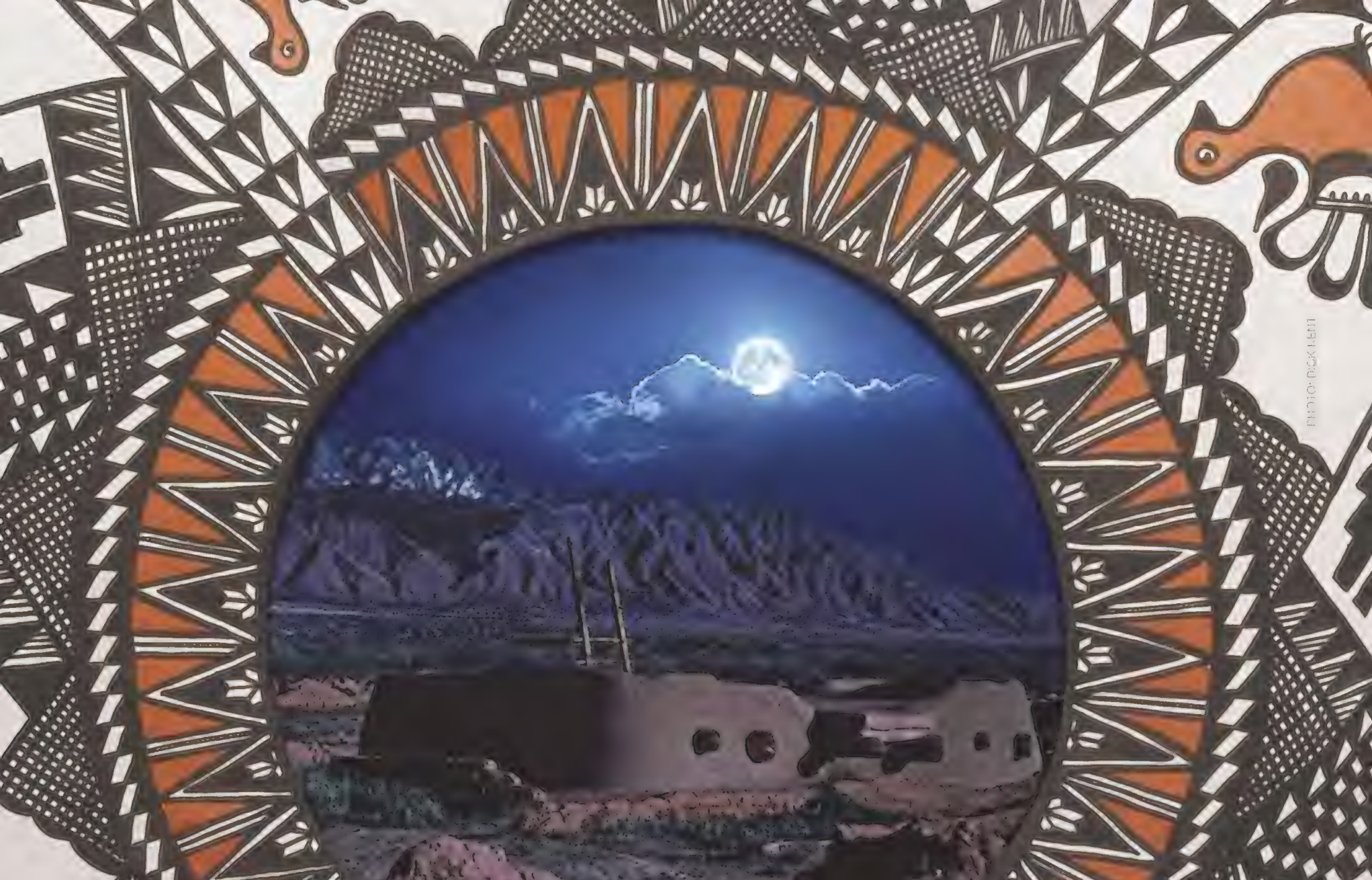

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FROM THE EDITOR

Crowd Pleasers

Too good to be true?

BY CAREY WINFREY

NOT EVEN LEIGH MONTVILLE, who was a sports columnist for the *Boston Globe* and a senior writer at *Sports Illustrated,* had ever heard of John Montague, the mystery man who sportswriter Grantland Rice believed, in 1935, just might be the best golfer in the world. Montville stumbled onto this Technicolor, larger-than-life figure while researching a book about Babe Ruth (*The Big Bam: The Life and Times of Babe Ruth*). An exhibition golf match that Ruth played with Montague on Long Island drew about 10,000 people, most of whom, Montville insists, had come to see Montague, not Ruth. "They had to quit after nine holes because the whole place went crazy," Montville adds, "so I started looking into it, and he had quite a story. He was a sensation."

Leigh Montville: "The whole place went crazy."

Was he ever. The story of the miscreant who reinvents himself (most often, it's a man) is peculiarly American. And never more peculiar than in Montague's case. In the Hollywood of that era, Montville writes, Montague could "outdrink, outeat, out-arm wrestle the world. Rumors soon circulated about how he had pointed at a string of birds on a telephone wire 175 yards away . . . unleashed his three wood and smacked a shot that not only hit [a] bird, but struck it dead." Then there was the time, legend has it, he hit a box of matches off a cocker spaniel's head. The dog, they said, never blinked. Montague even beat Bing Crosby in a one-hole match using a baseball bat, a shovel and a rake. Montville's story, "Montague the Magnificent," begins on page 76.

TONY PERROTTET'S FAVORITE MOMENT reporting our story about small house museums ("Small Wonders," p. 60) took place at Sir John Soane's Museum in London, on an evening when it was lit almost entirely by candles, as it is on the first Tuesday of every month. "The design of the house is amazing enough during the day," says the peripatetic Perrottet, who grew up in Sydney, Australia, but has lived in Buenos Aires, Manhattan and Rome. "You really feel transported back to the early 19th century—and particularly to Soane's famous sarcophagus parties of 1825, where the literati of London came to admire his new purchase from Egypt." For Perrottet, choosing just four museums proved to be the hardest part of the assignment. "There are dozens, if not hundreds, of these tiny places in European cities; it was sad to leave out museums in Amsterdam, Florence, Berlin and St. Petersburg—maybe they'll appear in 'Small Wonders II.'"

LINDA FINKLE

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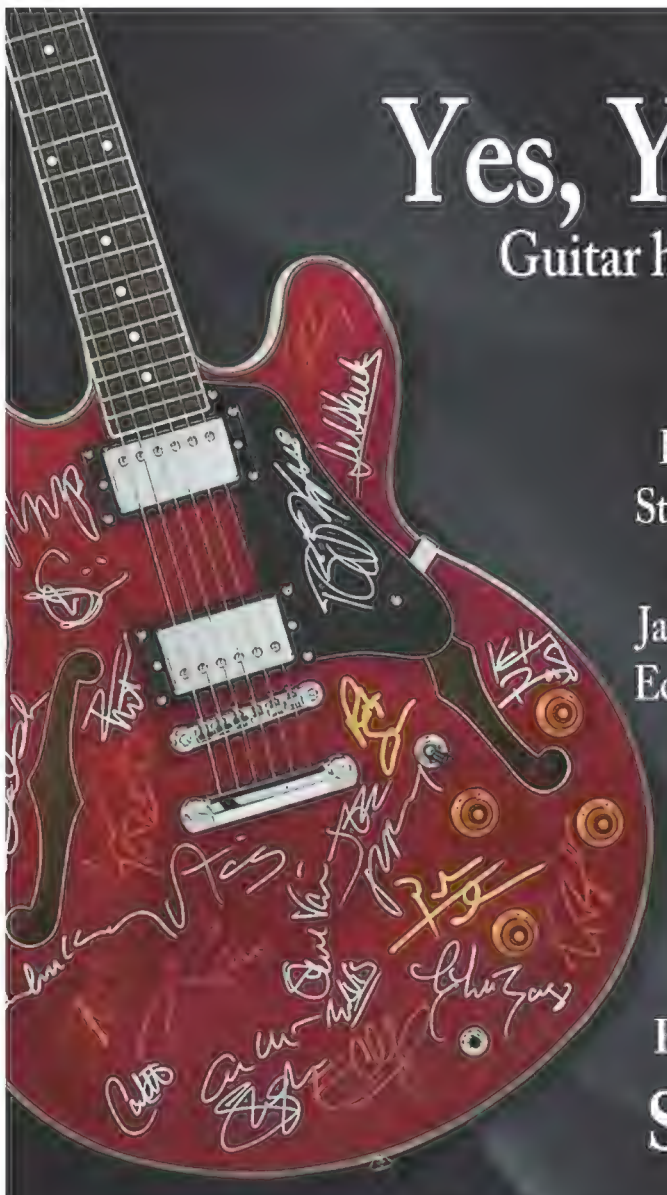
LETTERS READERS RESPOND TO THE **APRIL** ISSUE

Although I was very young when these events unfolded, I appreciate the historical perspective your article about LBJ ["The Unmaking of the President"] gave me. More important, at a time when we are so divided over so many issues, the article has shown me that we, as a country, have faced turbulent times before and gotten through them.

MEREDITH A. WAYANT, CHICAGO, ILLINOIS

LBJ'S AGENDA

CLAY RISEN'S article is well researched, but I disagree with his thesis that President Johnson was ready to unleash a major new series of domestic initiatives and pulled back only because of the riots that followed the King assassination. The immediate lift to the president's popularity following his withdrawal from the 1968 election allowed LBJ and his aides to dream, momentarily, that they could recreate the heady days of 1964-65, which produced the 1964 Civil Rights Act, the 1965 Voting Rights Act, Medicare and Medicaid, and aid in education. Those triumphs were the most important social legislation since Franklin Roosevelt's first 100 days. But by the end of 1966, when the Democrats suffered huge losses in the House of Representatives, the political



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climate had changed, and the votes in Congress for large, expensive social initiatives were already gone. A conservative backlash against civil rights and social reform brought a counterrevolution against social change that began not in 1968 but as early as 1964 with Barry Goldwater. The circumstances that had created the revolutionary changes of the mid-1960s were unusual: a masterful president, a great civil rights leader, a massive movement, a large Democratic majority in Congress and a national feeling that it was time to end racial discrimination. One wonders what will make the country take another giant step toward progressive reforms.

NICK KOTZ
AUTHOR, *JUDGMENT DAYS: LYNDON BAINES JOHNSON, MARTIN LUTHER KING JR., AND THE LAWS THAT CHANGED AMERICA*

PRURIENT JOURNALISM

I AM GLAD that Tom Fiedler is pleased with his exposé of Gary Hart [Presence of Mind: "Those Aren't Rumors"]. In the "New Journalism" no person in the public eye has any privacy. Frankly, many of us citizens care little about our politicians' private lives, as long as they do the job we elect them to do. Most of this so-called journalism is done strictly for prurient interests. We no longer can avail ourselves of the best possible candidates because many choose not to be exposed to such reporting, which may or may not be true. Are reporters any purer or more trustworthy than public figures? Reporters such as Tom Fiedler and Jim McGee have helped bring down the political climate.

MARSHALL H. COSSMAN
FLINT, MICHIGAN

AMAZING ADAPTATIONS

WILD THINGS proved to me once again the value of this excellent magazine. The unfortunate ant that contributed, willy-nilly, to the propagation of a nematode via an almost incredible natural selection process, and the romantically driven hummingbird that, more happily, tail-chirped his way to a potential mate in a power dive, were a delight. Visions of an ant that took on the appearance of a luscious berry and of the undoubtedly successful courting ritual of a four-gram bird quite haunted me.

JAMES "THE AMAZING" RANDI
JAMES RANDI EDUCATIONAL FOUNDATION
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SEEING IN REVERSE

IF ELLIS WEINER ["Mind Games"] will allow it, I offer craind—that drained feeling in the cranium that comes from trying to create an anagram for rancid.

BUCK PILKENTON
SUMPTER, OREGON

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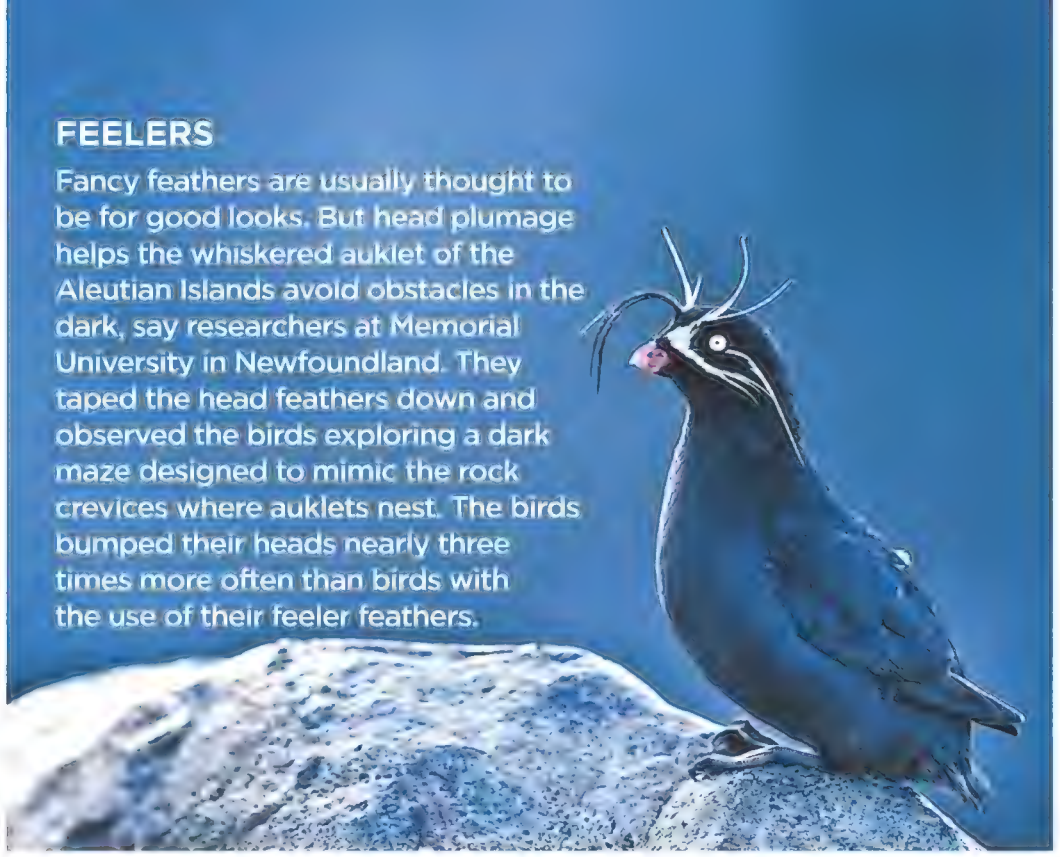
WILD THINGS

LIFE AS WE KNOW IT

BY KENNETH R. FLETCHER, T. A. FRAIL, MEGAN GAMBINO, LAURA HELMUTH, AND SARAH ZIELINSKI



FEELERS

Fancy feathers are usually thought to be for good looks. But head plumage helps the whiskered auklet of the Aleutian Islands avoid obstacles in the dark, say researchers at Memorial University in Newfoundland. They taped the head feathers down and observed the birds exploring a dark maze designed to mimic the rock crevices where auklets nest. The birds bumped their heads nearly three times more often than birds with the use of their feeler feathers.

MATCH UP

Joshua trees, the distinctive yuccas of the Mojave Desert, are evolving in step with moths, according to researchers at the University of Idaho. Plants in the eastern part of the Joshua trees' range have shorter stylar canals—the part of the flower that receives pollen—than do western ones. Turns out that two different species of yucca moths pollinate Joshua trees when they lay eggs. And the length of the canal corresponds to that of the local moths' egg-laying appendages.

Observed

NAME: *Heliconius erato* and *Heliconius melpomene,* two species of butterfly common in Central America.
AT FIRST SIGHT: They look alike. The main upside to their resemblance is enhanced protection. Both species are noxious, and predators learn to avoid them. The butterflies' similar appearance imparts the don't-eat-us lesson more efficiently.
ON SECOND THOUGHT: One downside to their resemblance is frustration, say researchers at the Smithsonian Tropical Research Institute. In experiments with *H. erato* and *H. melpomene*, males spent considerable time futilely courting females of the wrong species. Other mating cues, presumably olfactory, eventually set the guys straight.

A SOFT BODY BUT A HARD BITE

The tip of a Humboldt squid's beak (inset) is one of the hardest organic materials known. In fact, researchers have wondered why the beak doesn't shred the squid's own soft, gelatinous tissue when the animal bites its prey. (Imagine holding a knife blade with no handle and trying to carve a tough roast.) The key, say scientists at the University of California at Santa Barbara, is that the base of the beak, which is attached to the rest of the squid's mouth, is 100 times more pliant than the tip.

STANDING UP STRAIGHT AND TALL

The bone on the right is a modern human femur. The bone on the left is a slightly damaged six-million-year-old femur from the oldest known human ancestor, *Orrorin tugenensis*, discovered in 2000 in Kenya. How did our ancestor move? A new analysis led by George Washington University confirms that *Orrorin* walked on two legs.

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Tabled Resolution

Betty Ford had a what-the-hell moment—and an accomplice in photographer David Hume Kennerly **BY WILLIAM BOOTH**

ON JANUARY 19, 1977, the White House was filled with cardboard boxes, moving men and staff gathering for bittersweet goodbyes. People remember the cold. The *Washington Post* would report that the capital was "glistening with ice" as President Gerald R. Ford went about his last full day in office. He granted a pardon to Iva D'Aquino, a Japanese-American woman convicted of being one of the radio propagandists known collectively as "Tokyo Rose." He telephoned Soviet Communist Party leader Leonid I. Brezhnev to say goodbye. He awarded the Presidential Medal of Freedom to Donald Rumsfeld, his secretary of defense, the youngest in history at age 43. In a photograph taken that day by David Hume Kennerly, you see Rumsfeld flanked by his family. His son, Nick, is wearing sneakers in the Oval Office. It was a different time. The president himself favored plaid pants.

"I walked over to the West Wing to say goodbye to members of the staff who had served President Ford so well," Betty Ford, now 90, recalled in a written remembrance she sent from her home in Rancho Mirage, California, where she and her husband moved after they left Washington. "On the way back to the family quarters I passed by the empty Cabinet Room and thought, 'You know, I've always wanted to dance on the Cabinet Room table.'"

The night he was inaugurated, on August 9, 1974, President Ford invited Kennerly (above: with Ford in the Oval Office) to be the White House photographer. On her final day as first lady, Betty Ford (right) told Kennerly her idea for the Cabinet Room table.

Kennerly was 29 years old, bearded, funny, loyal, profane and talented. He had already won a Pulitzer Prize for work he'd done in Vietnam in 1971 for United Press International and was working for *Time* magazine when, on the night of Ford's hurried inauguration after President Richard M. Nixon resigned in August 1974, the new president asked him to be the White House photographer. Over the next 895 days of the Ford administration, Kennerly grew close to the president, who died in 2006, and he remains friendly with Betty Ford. When she voiced her idea about dancing on the Cabinet Room table to him, he recalls, "I said, 'Well, nobody's around.'" There was a Secret Service agent discreetly outside the door.

Betty Ford: "So I took off my shoes, hopped up there, and struck a pose."

Kennerly: "She said, 'I just think I'm going to do this.' Then she's on the table. She's a tiny woman, really, in very good shape. Very graceful, as a former dancer with the Martha Graham company. She got up there."

Kennerly snapped a few frames in black-and-white with his small Leica Rangefinder camera. The photographs show the long oval table, the studded leather chairs and what appear to be . . . candy dishes? He snorts. "Ashtrays! The president had his pipe. Tip O'Neill with his cigars. Dick Cheney [then White House chief of staff] smoked cigarettes like a chimney. I smoked. *Everybody* smoked."

Kennerly says he does not know why Betty Ford danced on the table, but he has a guess. "Very few women have had a seat at that table," he says. "I bet you could count them on one hand at that point, and knowing her support for the Equal Rights Amendment"—she endorsed it—"she was tap-dancing in the middle of this male bastion. She was

DAVID BURNETT / CONTACT PRESS IMAGES; P. 15 DAVID HUME KENNERLY

"She was tap-dancing in the middle of this male bastion. She was storming the walls of the gray suits."

Kennerly (below: in 2006) agreed to become the White House photographer after Ford promised him complete access, which allowed him to capture such moments as the president's meeting with Japanese Emperor Hirohito at a state dinner in 1975.

storming the walls of the gray suits and gray-haired eminences."

Betty Ford: "It was a wonderful and whimsical ending to that magical time I spent as the first lady."

Normally, Kennerly would see contact sheets of everything he shot, but not this time. "The next day I was out of a job when Jimmy Carter was inaugurated at noon," he says. So the picture disappeared—for 16 years—into the archives at the Gerald R. Ford Presidential Library in Ann Arbor, Michigan. It was first published in Kennerly's book *Photo Op* (1995) and republished in his recent *Extraordinary Circumstances: The Presidency of Gerald R. Ford.*

Kennerly, now 61 and working as a contributing editor for NBC, was initially hesitant to publish it at all. "As we all found out later, the first lady had a drinking problem," he says. "And in the intervening years, she confronted it—very brave—and talked about her alcoholism and wrote her book and started the Betty Ford Center and all that. I did not want people to put a martini glass in her hand and say here she is drunk on the Cabinet Room table. That would just be wrong. Because that is not what happened."

So, in 1994, Kennerly showed the photograph to the former president. "And it's like one of those cartoon moments where his eyes come bulging out, and he goes, 'Oh, Betty isn't going to like this.' Remember, he knows her better than anybody. I'm sunk. But he doesn't say anything when she comes in, and she looks at the picture and she starts laughing. She says, 'Oh, I forgot all about this. That is so great.' And I ask her, you won't mind? And Mrs. Ford says, 'No! It's a terrific picture.'

"Then President Ford says, 'Well, Betty, you never told me you did that.' And she smiles at him and says, 'There's a lot of things I haven't told you, Jerry.' "

WILLIAM BOOTH, *a reporter for the* Washington Post, *covers arts and culture from Los Angeles.*

DAVID HUME KENNERLY; KAREN BALLARD

For more pictures and an interview with David Hume Kennerly, visit Smithsonian.com/kennerly

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DIGS
Space Race II

Scientists worry that a contest to send robotic rovers to the moon will threaten lunar landmarks

BY MICHAEL MILSTEIN

THE SECOND RACE to the moon has begun—and this time there will be a big cash payout for the winner. Four decades after Neil Armstrong took his giant leap for mankind, the Google-sponsored Lunar X Prize is offering $20 million to any private team that puts a robotic rover on the moon, plus $5 million in bonus prizes for completing such tasks as photographing one of the numerous man-made artifacts that remain there—for instance, the Apollo 11 lunar module descent stage that Armstrong and Buzz Aldrin left behind in 1969.

One goal of the Lunar X Prize is to rekindle excitement in space exploration by beaming pictures of historic lunar locations to Web sites or even cellphones. But dispatching robots to snoop around the moon also poses a risk to some of the most precious archaeological sites of all time. What if a rover reached Tranquility Base, where Armstrong landed, and drove over footprints, which are still intact and represent humanity's first expedition to a celestial body? William Pomerantz, the director of space projects for the X Prize Foundation, acknowledges that possibility. "There's always a tradeoff between wanting to protect the history that's already there and wanting to visit the history," he says.

The competition brings into focus a potential problem that worries a growing circle of archaeologists and space historians: the careless destruction of invaluable lunar artifacts. At Charles Sturt University in Australia, Dirk H.R. Spennemann—who specializes in the preservation of technological artifacts—says Tranquility Base symbolizes an achievement greater than the building of the pyramids or the first Atlantic crossing. And because the moon has no atmosphere, wind, water or known microbes to cause erosion or decay, every piece of gear and every footprint remain preserved in the lunar dust. Spennemann advocates keeping all six Apollo sites off-limits until technology enables space-faring archaeologists to hover above them, Jetsons-like. "We only have one shot at protecting this," he insists. "If we screw it up, it's gone for good. We can't undo it."

The initial response to the Lunar X Prize initiative—which had ten registered teams at the end of April—suggests the moon's remoteness won't discourage unofficial visitors for long. History teaches a similar lesson. When the *Titanic* sank in 1912, few imagined that it would become an attraction. But not long after Robert Ballard discovered the wreckage in 13,000 feet of water in the North Atlantic in 1985, treasure hunters in submarines looted the doomed vessel of jewelry and dinnerware.

The Apollo 11 mission left behind more than 100 artifacts, including a spacesuit worn by Buzz Aldrin (above).

Crafting an agreement that bars exploration of lunar sites in the coming age of space tourism may be difficult. To be sure, nations retain ownership of spacecraft and artifacts they

NASA

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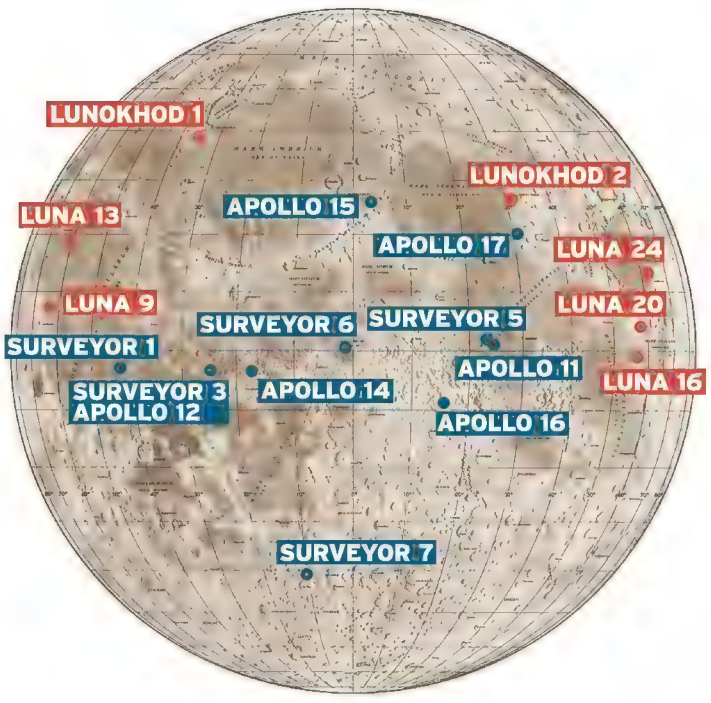
leave on the moon, though it (and the planets) are common property, according to international treaties. In practical terms, that means no nation has jurisdiction over the lunar soil, upon which artifacts and precious footprints rest. "It would be our strong preference that those items remain undisturbed unless and until NASA establishes a policy for their disposition," says Allan Needell, curator of the Smithsonian National Air and Space Museum's Apollo collection. The "preservation of the historical integrity of the objects and the landing sites" would be a primary goal, he adds.

A Nice Place to Visit

American (blue) and Soviet (red) lunar landing sites, from Luna 9 in 1966 to Luna 24 in 1976



HOW MUCH STUFF have people left on the moon? Professors and students from New Mexico State University (NMSU) cataloged equipment left behind at Tranquility Base and identified more than 100 items and *in situ* features from Apollo 11 alone, including Buzz Aldrin's spacesuit, Armstrong's famous footprint and a laser ranging retroreflector, which, for the first time, measured the precise distance between the moon and Earth. Much of the equipment was discarded by Armstrong and Aldrin just prior to lifting off to rendezvous with the orbital craft that would take them home; they needed to lighten the lunar module ascent stage, which they'd burdened with 40 pounds of lunar rocks and soil.

The New Mexico researchers had hoped that their inventory would help them gain protection for Tranquility Base as a National Historic Landmark. But the National Park Service, which oversees the program, rejected the proposal, saying the agency doesn't "have sufficient jurisdiction over the land mass of the Moon." Moreover, a NASA lawyer advised that merely designating a lunar site a landmark "is likely to be perceived by the international community as a claim over the Moon"—a land grab that would place the United States in violation of the 1967 Outer Space Treaty. So Beth Laura O'Leary, an anthropologist who led the NMSU project, added the historic lunar site to an official list of archaeological sites maintained by the state of New Mexico. It's a largely symbolic gesture, but it does mean at least one governmental body recognizes Tranquility Base as a heritage site. "You don't want people putting pieces of Apollo on eBay any more than you want them chiseling away at the Parthenon," O'Leary says.

Of course, NASA itself has done some extraterrestrial salvaging. In 1969, in arguably the first archaeological expedition conducted on another world, Apollo 12 astronauts Alan Bean and Pete Conrad visited the robotic Surveyor 3 spacecraft, which had landed two years earlier. They inspected the landing site and removed the spacecraft's television camera, a piece of tubing and the remote sampling arm. The parts were returned to Earth so researchers could assess the lunar environment's effects on equipment.

While archaeologists take a hands-off approach to the six Apollo landing sites, researchers are more open to granting access to robotic sites. Charles Vick, a senior analyst at GlobalSecurity.org and an authority on the Russian space program, says historians could learn a lot about the still-shrouded Soviet space program by studying equipment left behind during the USSR's Luna probes, which landed between 1966 and 1976. In 1969, the USSR's Luna 15 probe crashed into the moon. Its mission was believed to be collecting lunar rocks and returning them to Earth, but scholars in the West still aren't sure. "We're not going to know until we go there and check it out," Vick says.

Without new international agreements, the norms governing lunar archaeology are likely to remain vague. The Lunar X Prize rules state that an entrant must get approval for a landing site and "exercise appropriate caution with regard to the possibility of landing on or near sites of historic or scientific interest." Teams going for the bonus prize must submit a "Heritage Mission Plan" for approval by the judges, "to eliminate unnecessary risks to the historically significant Sites of Interest." (Lunar X Prize participants were scheduled to meet in late May to discuss the rules and guidelines.) Still, the contest rules don't specify what constitutes an unnecessary risk. And there's no guarantee where the competing spacecraft will end up. With no traffic cops on the moon, the only deterrent against damaging sites might be the prospect of negative publicity.

O'Leary says the Lunar X Prize's lack of regulation is "scary"—a sentiment shared by others. But at least one Lunar X Prize entrant, William "Red" Whittaker, a professor of robotics at Carnegie Mellon University, has a simple solution to minimize risk: after landing, his team's rover would use telephoto lenses to view Tranquility Base from afar.

To Pomerantz, the competition's director, merely debating how to protect lunar history is a welcome sign that humanity is finally on the verge of going back: "It's exciting when questions that seemed distant and hypothetical are becoming not too distant and not too hypothetical after all." For now, archaeologists are just hoping a robotic rover doesn't take a wrong turn.

MICHAEL MILSTEIN *writes for* The Oregonian *in Portland.*

PHILIP J. STOOKE / UNIVERSITY OF WESTERN ONTARIO

Finding a lost civilization in Belize.

"My husband Woody and I stepped out of the Chiquibul Rainforest and felt like we had just discovered a lost civilization; there in front of us stood Caracol, the largest of Belize's Maya ceremonial centers.

The temple and surrounding scenery are magnificent, with lush palm trees and orchids growing beautifully in the wild. We took a break for a moment in the cool shade of the temple and watched a green iguana bobbing its head up and down as if nodding hello. We hiked the whole area with our wonderful guide, Rocky Mai, who gave us a running commentary on the Maya in perfect English.

Belizeans are the friendliest people we've come across in our travels, and the country itself is amazing. One minute you're hiking through an untamed ecosystem, the next you're walking through the door of a plush resort with all the amenities. This is my idea of roughing it."

– Ann Bridges –

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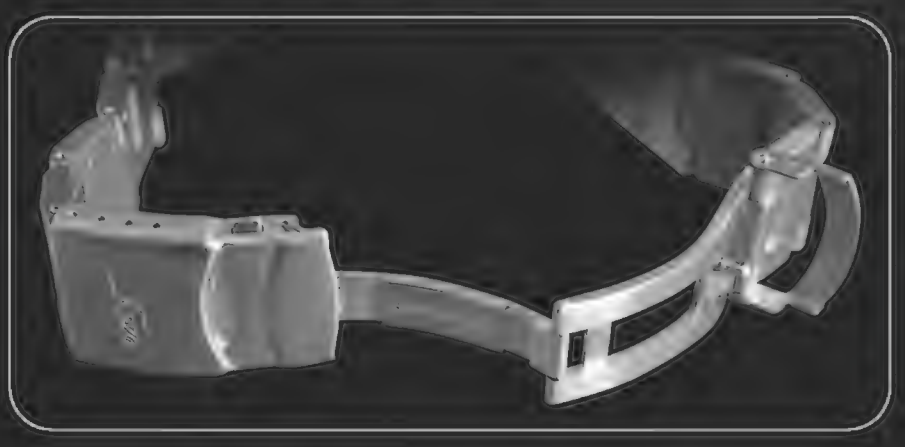

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INTERVIEW

WALLACE BROECKER

GEOCHEMIST, PALISADES, NEW YORK

How to stop global warming? CO_2 "scrubbers," a new book says

BY KENNETH R. FLETCHER PHOTOGRAPH BY PATRICK HARBRON

WALLACE BROECKER, of Columbia University's Lamont-Doherty Earth Observatory, first warned in the 1970s that the earth would warm because of a buildup of carbon dioxide and other gases released by burning fossil fuels. In his new book, *Fixing Climate* (co-authored by Robert Kunzig), Broecker, 76, argues that we must not only reduce emissions of carbon dioxide (CO_2) but also remove it from the atmosphere on a massive scale to avert environmental ruin. He is an unpaid adviser to Global Research Technologies, a Tucson firm developing devices to capture CO_2 from the air.

HOW DO YOU "FIX" CLIMATE? We need something that can be manufactured, like air conditioners or cars, by the millions. Each day, a unit would take about a ton of CO_2 out of the atmosphere, liquefy it and send it through pipes to wherever it's going to be stored. The developers are now envisioning a device about 6 to 10 feet in diameter, 50 feet high.

HOW MANY DEVICES WOULD BE NEEDED? Each of us in America is responsible for generating about 20 tons of CO_2 a year. So I suppose roughly 17 million scrubbers would take care of the United States. Worldwide, we'd need a lot more. On a long time scale the rich nations can do more than just stop or neutralize their own emissions. They can also neutralize some of what was done in the past.

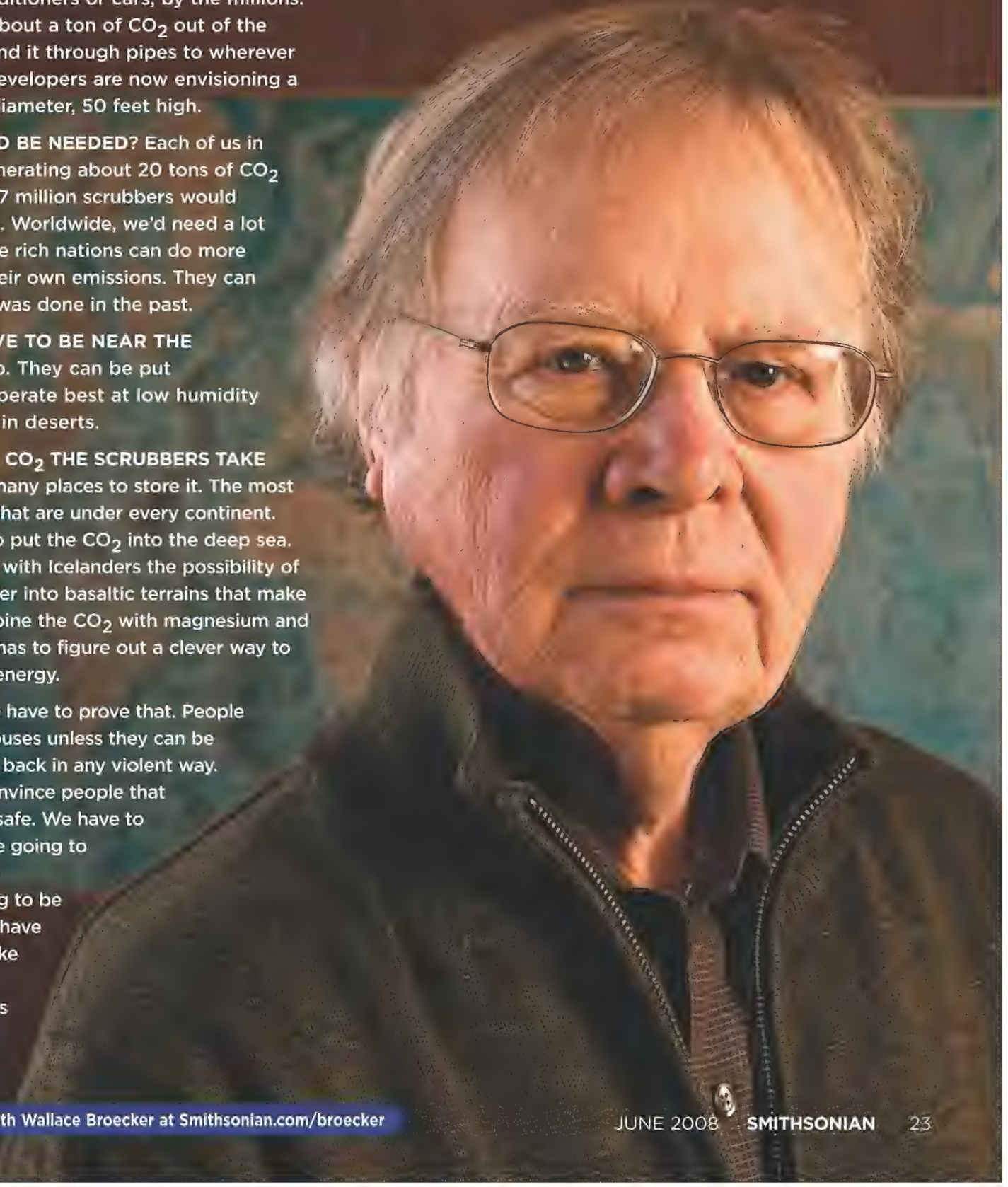
THE SCRUBBERS DON'T HAVE TO BE NEAR THE SOURCE OF POLLUTION? No. They can be put anywhere. The units would operate best at low humidity and would be best deployed in deserts.

WHAT HAPPENS TO ALL THE CO_2 THE SCRUBBERS TAKE OUT OF THE AIR? There are many places to store it. The most obvious is the saline aquifers that are under every continent. Ultimately, I think we'll want to put the CO_2 into the deep sea. We at Columbia are exploring with Icelanders the possibility of injecting CO_2 dissolved in water into basaltic terrains that make up the earth's mantle, to combine the CO_2 with magnesium and convert it into a mineral. One has to figure out a clever way to do this without using a lot of energy.

IS THIS SAFE? We're going to have to prove that. People won't want CO_2 under their houses unless they can be assured it's not going to come back in any violent way. I think it would be easier to convince people that putting it into the deep sea is safe. We have to do something. Otherwise we're going to have a very hot planet and the environmental damage is going to be huge. Any solution is going to have consequences. We have to make sure those are very small compared to the consequences of doing nothing.

WHAT ABOUT ALTERNATIVE ENERGY SOURCES? I don't think anybody believes that alternatives will supply the energy we'll need. The long-term solution is solar electricity. But it is far too expensive—there have to be breakthroughs. If they were to occur in the next 10 or 20 years, great, we could put the whole CO_2-capture idea on the shelf.

ARE YOU OPTIMISTIC? I'm an optimist, but I wish I was a little bit younger and could see how this thing really plays out over the next 50 or 60 years. It will be the major issue in the world for a long, long time.

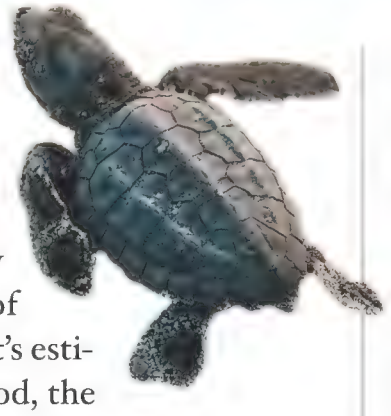


Read an extended interview with Wallace Broecker at Smithsonian.com/broecker

POINTS OF INTEREST

NOTABLE AMERICAN DESTINATIONS AND HAPPENINGS

Shell Gains



NORTH PADRE ISLAND, TEXAS Every few days in the summer, a dozen or so people gather here on the north beach just before dawn to watch newly hatched Kemp's ridley turtles, the size and color of overbaked gingersnaps, plunge into the surf. While it's estimated that only one in 300 will make it to adulthood, the odds for the survival of this endangered species (*Lepidochelys kempi*) have improved dramatically in the past 20 years. Thanks to conservation efforts, a record 10,596 hatchlings scuttled off Texas beaches last year.

"Humans caused the ridley's decline," says National Park Service biologist Donna Shaver, "and now humans are part of their success." In the 1960s and '70s fishing nets and poaching nearly wiped out the ridleys, which live on the Gulf and Atlantic coasts. In 1978, biologists began collecting turtle eggs from a remote beach in northern Mexico and bringing them to Texas beaches to re-establish nesting. Fifteen years later, the first of those turtles returned to lay eggs. Although commercial nets and predators still take their toll on turtles, the number of nests is steadily rising in Texas, from 8 in 2001 to 128 last year.

This barrier island's annual nesting season begins around April, when adult females come ashore. Each digs an 18-inch-deep hole in the sand, deposits about 100 eggs, covers them and returns to the ocean. To guard against the eggs being eaten by coyotes and raccoons or swept away by a high tide, biologists collect them and incubate them in sand-filled coolers at a laboratory. About 50 days later, the turtles hatch. As scientists release them, the hatchlings head for the surf, swimming several miles in open water to the safety of seaweed, where they can feed and hide from predators. Call the hatchling hot line (361-949-7163) for dates and release times. BY MELISSA GASKILL

Iowa's Bottled Sand

DES MOINES Powdery grains of colored sand in a foot-tall bottle form a picture so astonishingly detailed that you can see the fringe on George Washington's jacket and the flared nostrils of his white horse. The sand-art bottle at the State Historical Museum was created by Andrew Clemens (1857-94), an Iowan who collected rocks—colored pink, blue and green by iron oxide—from bluffs along the Mississippi River. After pulverizing the rocks and mixing 42 different hues of sand, he layered it into bottles, creating intricate geometric patterns, flowers, eagles, steamships and more. Though most of Clemens' works have been shaken or shattered, an intact rendering of a ship recently sold for almost $12,000. Of the museum's five Clemens bottles, curator Michael Smith says: "We don't move them much." BY MICHAEL MORAIN

CYNTHIA RUBIO / NATIONAL PARK SERVICE; JULIO BARRADA; STATE HISTORICAL SOCIETY OF IOWA

To see a video of turtles, visit Smithsonian.com/points

Road Work Ahead

WEST GLACIER, MONTANA A mere 18 feet wide in some stretches, the scenic 50-mile Going-to-the-Sun Road traversing Glacier National Park hugs cliffs and switchbacks, making a drive as white-knuckled as it is beautiful. During repairs to the road this summer, park officials will provide free rides in large-windowed shuttle buses to ease congestion. An emerald valley shimmers 3,000 feet below. Waterfalls cascade down rocky parapets. Snowcapped Rockies pierce the sky. There are reasons aplenty to relish the delays. BY BOB WYSS

Storied House

NEW YORK CITY It stands on what was once the most crowded block in the densely populated Lower East Side. Built in 1863, the five-story, 20-unit tenement at 97 Orchard Street had housed 7,000 immigrants by the time it closed in 1935. Twenty years ago a nonprofit group turned it into the Lower East Side Tenement Museum, restoring six apartments to reflect the lives of former residents. It's 1918 in the apartment of the Rogarshevskys, from Lithuania. Abraham, a presser in a garment factory, has just died and a meal of bialys and hard-boiled eggs is on the table.

Nathalie Gumpertz, from Germany, lived here in 1875. Her sewing machine sits in the parlor. She makes dresses to support her three children since her husband disappeared on his way to his job at a shoe factory. In 2001, Nathalie's great-great-grandson was lost in the World Trade Center attack. A year later, his widow visited the apartment, contemplating the husbands who never returned. BY MARIANA GOSNELL

Celestial Mechanics

SPRINGFIELD, VERMONT A grassy hilltop is home to Stellafane, the nation's oldest convention of amateur telescope makers. Stargazers have gathered here since 1923, bringing their homemade inventions to view the dark sky—and show off. The motley display of ingenuity includes no-frills contraptions fashioned from plywood and copper tubing as well as elegant polished mahogany scopes with painstakingly hand-ground mirrors. One scope last year resembled a three-foot wooden salad bowl with a superstructure of black tubing. Another was so large it came with a stepladder. At this year's annual festival, July 31 to August 3, judges will award prizes for craftsmanship and optical performance. Workshops and swap meets round out the festivities. Stellafane (Latin for shrine to the stars) dates to 1920, when Russell Porter, an arctic explorer, taught 15 men and one woman to hand-grind their own mirrors at a local factory, sparking a build-your-own scope craze. "The amateur movement started here," says Alex McConahay, from California. "It's like going to St. Peter's in Rome." BY CHRIS GRANSTROM

CHUCK HANEY / DANITADELIMONT.COM; BATTMAN STUDIOS; COMPOSITE PANORAMA PHOTO BY PHIL HARRINGTON

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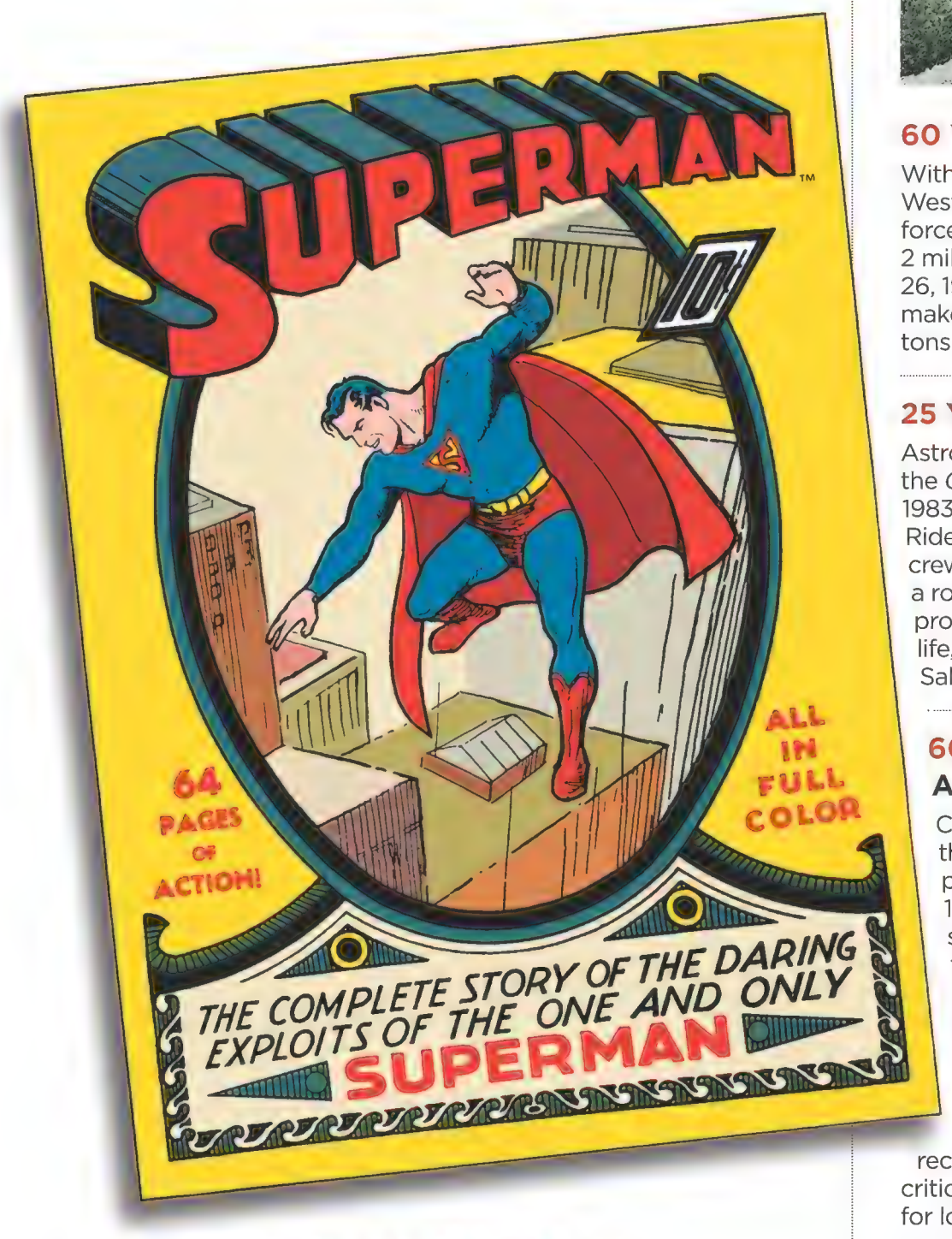


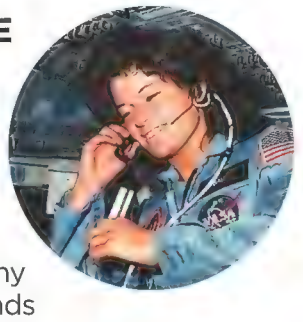
70 YEARS AGO
HERO'S WELCOME

Superman debuts in the June 1938 Action Comics No. 1. Created by Jerry Siegel and Joseph Shuster, the caped superhero can "hurdle a twenty-story building" and "run faster than an express train," but can't fly until the 1940s (above: a 1939 leap). The pair sell the rights to Superman for $130; in 2008 a judge returns a share of the copyright to Siegel's heirs.

60 YEARS AGO HELP FROM ABOVE

With Berlin blockaded by the Soviets, determined to force Western withdrawal from the city, American and British forces begin flying in flour, coal and medicine to aid its 2 million residents—including 10,000 Americans—on June 26, 1948. By its end in September 1949, the Berlin Airlift makes some 277,000 flights to deliver more than 2 million tons of supplies. The Berlin Wall goes up in 1961.

25 YEARS AGO RIDE, SALLY RIDE



Astrophysicist Sally Ride, 32, blasts off in the *Challenger* space shuttle on June 18, 1983, the first American woman in space. Ride, an astronaut since 1978, and other crew members deploy satellites and test a robotic arm she helped design. "It's probably the most fun I will ever have in my life," she says on landing. In 2001 she founds Sally Ride Science to encourage schoolgirls to join the fun.

60 YEARS AGO A NEW RECORD

Columbia Records unveils the 33 ⅓ LP (for long-playing) record June 21, 1948. With a slower speed and more than triple the grooves of standard 78s, the 12-inch discs play for 45 minutes—almost six times longer—and take up less space (right). Not having to change records so often, says a critic, makes LPs "sensational for longhairs." And for everyone else: by year's end, 1.25 million have sold.

80 YEARS AGO OCEAN'S FOUR

Eighty-three flight hours, two stops and 7,388 miles after leaving Oakland, California, Australian pilot Charles Kingsford Smith and his team (below: Harry Lyon, Charles Ulm, Kingsford Smith and James Warner) land their Fokker F.VIIB plane *Southern Cross* in Brisbane, Australia, to complete the first trans-Pacific flight, June 9, 1928. "None could have succeeded without the others," says Kingsford Smith, who dies, at 38, in a 1935 plane crash.

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Around the Mall

SCENES AND SIGHTINGS FROM THE SMITHSONIAN MUSEUMS AND BEYOND

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MARCELA DE NIZ / FERIA INTERNACIONAL DEL LIBRO DE GUADALAJARA MEXICO / FESTIVAL DE LA LEYENDA VALLENATA

HAIL TO THE KING

AN ANNUAL CONTEST—WHERE MUSICIANS COMPETE FOR THE COVETED CROWN OF "ACCORDION KING"—STRIVES TO PRESERVE TRADITIONAL COLOMBIAN FOLK MUSIC

PAGE 31

"We are defenders of what is truly authentic," says Hugo Carlos Granados, dubbed the "King of Kings" in 2007.

FROM THE CASTLE | What a Year!

BY CRISTIÁN SAMPER

A LIST OF THE NEW SEVEN WONDERS of the world, published this past April by *Condé Nast Traveler*, included the Smithsonian's magnificent new Robert and Arlene Kogod Courtyard, with its free-standing glass roof designed by British architect Norman Foster for the Donald W. Reynolds Center for American Art and Portraiture. But the courtyard's opening in November 2007, grand as it was, was only one highlight of what for me has been a deeply gratifying year as Acting Secretary. I've chronicled some of the other highlights in the 12 columns I've written for this space. (They're at Smithsonian.com.)

Pools at the Kogod Courtyard reflect the roof—and invite visitors to walk on water.

A column called "Small World" described one of my favorite exhibitions, "Encompassing the Globe: Portugal and the World in the 16th & 17th Centuries," which showed how sailing ships moved goods and information around the world in ways not so different from today's Internet—just slower. "Co-Evolution" focused on the National Museum of Natural History's new butterfly exhibition; there, visitors discover how animals and plants evolve in response to one another. "Aero Dynamic" announced a spectacular new gallery at the National Air and Space Museum devoted to passenger air travel. "Health Checks" summarized a trailblazing Smithsonian study of tropical rain forests, which will help scientists monitor climate change. In "Hello? *Hello?*" I presented plans for a giant new telescope in Chile capable of photographing young planets as they are forming around a faraway star. And in "Life on the Web" I reported on the Encyclopedia of Life, an extraordinary Web portal that will create a site for each of earth's 1.8 million known species. "Barcoding 101" described DNA barcoding, a revolutionary technology for distinguishing species that has countless practical applications, such as reducing bird-airplane collisions and protecting important fish populations.

The Institution has also made far-reaching internal changes over the past year. We worked with Congress to address the $2.5 billion needed for overdue maintenance and began planning a national fundraising campaign. We refocused our business unit, Smithsonian Business Ventures, and solicited proposals for the best way to renovate—and ultimately, to use—our endangered Arts & Industries Building. "Smithsonian Connections," funded by a member of the Smithsonian National Board, will create materials to help Smithsonian visitors better understand how our diverse collections relate to one another; collaboration among our scholars in both sciences and humanities is increasingly important since some of the most creative questions lie at the boundaries of disciplines. As I look to the future, I am filled with optimism for the Institution under the leadership of our new Secretary, G. Wayne Clough, who takes up the reins next month.

CRISTIÁN SAMPER *is Acting Secretary of the Smithsonian Institution.*

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TIM SLOAN / AFP / GETTY IMAGES

SQUEEZE PLAY

A NEW SMITHSONIAN NETWORKS FILM BRINGS ALIVE THE UPBEAT MUSIC OF COLOMBIA'S COWBOY COUNTRY

Colombian singer Carlos Vives (left, with Egidio Cuadrado at the 2007 festival) is bringing worldwide fame to the genre.

IT MIGHT NOT BE OBVIOUS why filmmakers traveled to a remote valley near Colombia's Caribbean coast, a region best known for its drug war, to document a six-day festival of accordion music. But the fast, upbeat melodies of *vallenato*, as the regional Colombian music is called, have universal appeal, says the documentary's producer, Alan Tomlinson. Vallenato can "reach out across distances, perhaps create a new understanding of Colombia," he says. "Colombia does not get much written about it that's positive." On June 6, *The Accordion Kings*, a Smithsonian Networks film, will première at the Natural History Museum.

Vallenato is something of a musical melting pot, derived from various aspects of local history: the dominant instrument is the accordion, brought to South America by European immigrants. It's accompanied by the small *caja* drum, which evolved from those once used by African slaves, and also by a notched stick scraped to provide percussion called the *guacharaca*, which originated with Colombia's native population. The resulting music, first documented in the late 1800s, has come to define coastal Colombia almost as much as the works of author Gabriel García Márquez. In fact, the Nobel Prize winner is said to have described his epic novel, *One Hundred Years of Solitude*, as a 400-page vallenato.

Enthusiasts say vallenato artists tell everyday stories of love and loss that have a lot in common with country music in the United States. Vallenato used to be considered low-class music for field hands, rarely played outside Colombia's cowboy country. But in recent years, Colombian singer Carlos Vives, among others, has fused vallenato with pop to create hits played across the Spanish-speaking world.

The documentary focuses on an annual competition among accordion virtuosos for the "vallenato king" crown, awarded at the festival in Valledupar, vallenato's Nashville. Wearing straw cowboy hats and jeans, the hopefuls are covered in sweat, eyes closed, bodies rocking, fingers blurring as they fly across the accordion's keys. The competition's nationally televised finale has the drama and fanfare of "American Idol." As the genre becomes mainstream, festival organizers say the competition, which promotes the traditional form of vallenato, preserves their musical heritage. "It's a way of linking you to the land, to your ancestors, your traditions," says Gabriela Febres-Cordero, the honorary president of the 40-year-old festival.

Reigning vallenato king Hugo Carlos Granados has won the crown five times—and at last year's festival he took the "king of kings" title, beating out 18 other vallenato kings in a special overarching competition that takes place once every decade. In the film he walks with a painful-looking limp, the result of a car accident after a late-night concert, but he pumps the heavy instrument with intensity. Granados, who comes from a long line of accordionists and started playing at age 5, believes the competition is about much more than showing off skill. "We are defenders of what is truly authentic vallenato," he says in Spanish by phone from Colombia. "We defend it so that vallenato music keeps going and new generations can hear it."

KENNETH R. FLETCHER

JUKEBOX

LOVE SONG Last year, Smithsonian Folkways invited local musicians to a studio in Valledupar, Colombia, to record traditional *vallenato* music at its best. Seated in the studio and surrounded by fellow musicians, Leandro Díaz, 80, who claims to have composed 400 songs, told the story behind one of his greatest hits, "Matilde Lina." Years ago, a beautiful woman sat next to Díaz on a park bench. He fell in love and sought to court her. But each time he visited her, he found another suitor already there. "She stayed at home," he muses, "and I got this song." Hear his son, Ivo Díaz, as he performed it on the new Folkways recording "¡Ayombe!" at Smithsonian.com/jukebox. K.R.F.

See a film clip from *The Accordion Kings* at Smithsonian.com/accordion

RICARDO MAZALAN / AP IMAGES; SMITHSONIAN FOLKWAYS RECORDINGS

THE OBJECT AT HAND

1933 Double Eagle

NATIONAL MUSEUM OF AMERICAN HISTORY

GOLDEN GRAIL

Few U.S. coins are rarer than the never circulated 1933 double eagle, melted down after the nation dropped the gold standard **BY OWEN EDWARDS**

THESE DAYS, with the mighty greenback looking green at the gills and the euro laughing all the way to the bank, even our once-durable coinage is under assault. Critics are calling for the extinction of the penny; although Thomas Jefferson still graces the nickel, his portrait has been reworked; and quarters come in 50 flavors. And whatever happened to the half dollar? What's worse, nobody seems to care about the aesthetics of pocket change.

There was a time when coins were small masterpieces crafted by artists, when no less a personage than President Theodore Roosevelt took an interest in their design. Two almost impossibly rare gold pieces in the collection of the Smithsonian National Museum of American History (NMAH) testify to TR's quest for numismatic glory.

In the early 1900s, the president decided that the $20 double eagle (fashioned after the $10 coin bearing the image of our national bird), in circulation since the mid-19th century, needed a face-lift. To do the job, he called on America's preeminent sculptor, Augustus Saint-Gaudens, who had designed TR's 1905 inaugural medal.

Although Saint-Gaudens was terminally ill—he would die of cancer in August 1907—the sculptor created what many consider to be the most beautiful coin this country ever minted. One side depicts an eagle in flight; on the obverse, the figure of Liberty strides forward, torch in one hand and olive branch in the other, her hair streaming behind her. The model was Harriette Eugenia Anderson, a young woman originally from South Carolina; Saint-Gaudens described her as "certainly the handsomest model I have ever seen of either sex."

President Theodore Roosevelt commissioned the double eagle (right) in 1905. He later pronounced the gold piece to be "the best coin that has been struck for 2,000 years."

The new double eagle, introduced in 1907, was coin of the realm for the next 16 years, until Teddy's cousin, President Franklin Roosevelt, moved the country off the gold standard in 1933. Gold coins of all denominations were ordered exchanged for paper currency. (Collectors were exempted from the law, a loophole that has resulted in any number of lawsuits.)

At the nation's Mints in 1933, gold coins were melted down and converted into ingots. According to Alison Frankel, author of *Double Eagle: The Epic Story of the World's Most Valuable Coin*, George McCann, a laborer at the Philadelphia Mint, seems to have succumbed to a temptation—just as the last of the uncirculated 1933 double eagles were headed to the melting chamber. "There are many instances," says Frankel, "of people pocketing coins that are about to become rare."

Only nine days later, after 2,000-degree fires had turned most of Saint-Gaudens' masterpieces into mush, a Philadelphia jeweler, Izzy Switt, would sell one double eagle, almost certainly obtained from McCann, to a coin collector.

Because 1933 double eagles were never circulated and were thought to have all been melted down, collectors view the handful in existence as the most numinous of numismatic treasure. Mystery

Watch a Smithsonian Networks film clip about the 1933 double eagle at Smithsonian.com/eagle

NATIONAL PORTRAIT GALLERY, SI / ART RESOURCE, NY; TOM MULVANEY / NMAH, SI

continues to surround them. "We don't know how many survived," says Richard Doty, an NMAH curator.

According to Doty, the Smithsonian received its pair of 1933 double eagles in 1934. The federal government donated the gold pieces, Doty says, as "coins of record." (NMAH holdings contain examples of virtually every form of coinage produced by the U.S. Mint.)

Another 1933 double eagle to escape destruction owes its existence to Egypt's King Farouk. A passionate coin collector, Farouk somehow arranged for a double eagle to be shipped to Cairo only days before Secret Service agents began rounding up all unsurrendered gold coins. After Farouk was overthrown in 1952, his extensive collections were auctioned. One lot contained his double eagle; the United States demanded that it be returned. Though the Egyptians removed the coin from auction, it disappeared for many years.

In the mid-1990s, a 1933 double eagle—in all likelihood Farouk's—turned up in the hands of British coin dealer Roger Fenton. After a convoluted legal battle, it was auctioned at Sotheby's for $7.59 million in 2002. (Fenton and the U.S. government split the proceeds.)

On the reverse, says Frankel, the eagle is depicted so realistically that its beak "seems almost dangerous."

At the time, this coin and the Smithsonian's pair were thought to be the only 1933 double eagles. But then, in August 2005, says Doty, "ten more surfaced." The owner: none other than Philadelphia jeweler Izzy Switt's daughter. The federal government wants those coins back. Lawsuits are pending. "I've seen all ten at an exhibition in Denver," Doty says. "For collectors, it was a religious experience."

OWEN EDWARDS *is a freelance writer and author of the book* Elegant Solutions.

Q&A

ROBERT BULLARD of Clark Atlanta University is often called the father of the environmental justice movement for his efforts to fight toxic dumping in minority communities. He recently delivered a lecture sponsored by the Smithsonian's Anacostia Museum. The magazine's Kenneth R. Fletcher spoke with him.

WHEN DID YOU CONCLUDE THAT ENVIRONMENTAL PROBLEMS AFFECT MINORITIES DISPROPORTIONATELY? In 1978, when I was an assistant professor in sociology at Texas Southern University, I collected data for a lawsuit filed on behalf of a black middle-class community in suburban Houston targeted for a landfill. My students and I found that 100 percent of city-owned landfills in Houston were located in predominantly black neighborhoods, even though African-Americans accounted for only 25 percent of the population. I expanded that research to include the entire southern United States. Since then I've discovered that it's a national phenomenon.

WOULD YOU CALL THIS ENVIRONMENTAL RACISM? We were the first to use the 1964 Civil Rights Act to fight discrimination in the location of a waste facility. We made that connection. You have a right to breathe clean air, you have a right to drink clean water, you have a right for your food to not be poisoned—just as you have a right to fair employment and equal opportunities in education.

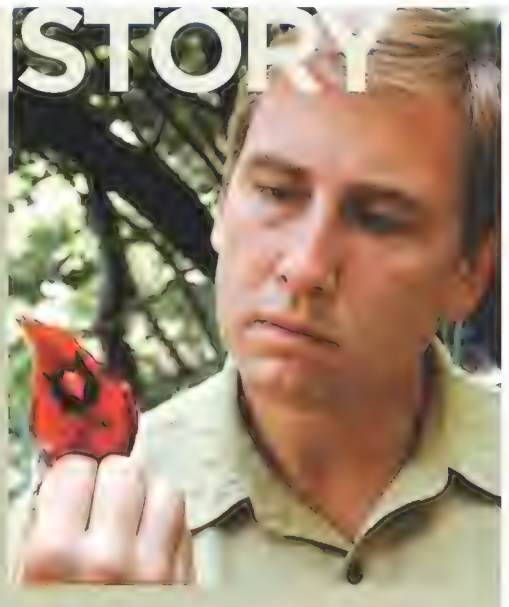
IS LOW INCOME A FACTOR? A study 20 years ago found that race—not income, socioeconomic status or property values—is the most potent predictor of where these waste facilities are located. In a February 2007 study, we found this still holds true.

Visit Smithsonian.com/bullard to read more of our interview with Robert Bullard

MAKING HISTORY

EARLY BIRDS Researchers have long wondered whether migratory birds return to their birthplace to breed. But a new study, co-authored by Colin Studds, Kurt Kyser and Peter Marra at the Smithsonian Migratory Bird Center, says choice of breeding ground is affected by where young birds spend their first winter. The scientists followed the travels of the American redstart, a small songbird native to North America that winters in Latin America and the Caribbean. While some redstarts settle in Jamaica's lush mangrove swamps, others end up in nearby dry scrub, where they tend to lose weight. Come spring, healthier birds head home about a week sooner than their scrub-dwelling, less fit brethren. These early birds arrive in the southern United States when food is plentiful. The thinner redstarts leaving later must head farther north to find enough food. The research suggests that climate change could impact migratory patterns. Tropical climates are predicted to get drier, "which could delay bird departure, even from good habitats," says Marra.

KENNETH R. FLETCHER



Marra, with a cardinal.

FLIP CHALFANT; TOM MULVANEY / NMAH, SI; NATIONAL ZOOLOGICAL PARK, SI

What's Up

SECOND IMPRESSION

For her Hirshhorn exhibit (through July 6), Amy Sillman painted couples who posed for her. Later she painted them again from memory, developing more abstract versions like *S* (above).

PURE SCULPTURES

Elephant ivory has long been a status symbol, representing purity. See 74 ivory pieces, including this mid-1800s figure carved by the Yoruba people of Nigeria, at African Art through August 17.

DREAM CATCHER

The Heye Center in New York City presents a multimedia exhibit of 15 modern Native American artists between June 7 and September 21. "Remix" includes Luis Gutierrez's *She Must Be Speaking to the Spirits* (right).

FACE TIME

Two enormous portraits of individuals deep in meditation, exuding tranquillity, dominate the pavilion at the Sackler Gallery (above). Contemplate the exhibit, by Iranian-born artist Y. Z. Kami, through October 13.

TRIPLE VISION

Barbara Bosworth creates panoramas, like *National Champion Saguaro* (left), by combining several negatives to make one print. On June 20 at American Art, 40 of her photos go on view.

BY KENNETH R. FLETCHER

VISIT THE SMITHSONIAN For a free Associates' planning packet, call 202 633-1000 or 202 357-1729 (TTY), 9 a.m. to 5 p.m. Monday through Friday and 9 a.m. to 4 p.m. Saturday. Or send an e-mail to info@si.edu. The Smithsonian Information Center in the Castle is open daily, 8:30 a.m. to 5:30 p.m. Members can visit the reception desk between 9 a.m. and 4 p.m. to register for a behind-the-scenes tour and to hear about membership benefits. Most museums are open daily, 10 a.m. to 5:30 p.m. All museums are closed December 25.

For an insider's look at the Smithsonian, visit Smithsonian.com/mallblog

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FORGET *JAWS*, NOW IT'S . . .

BRAINS!

Great white sharks are typecast, say experts. The creatures are socially sophisticated and, yes, smart

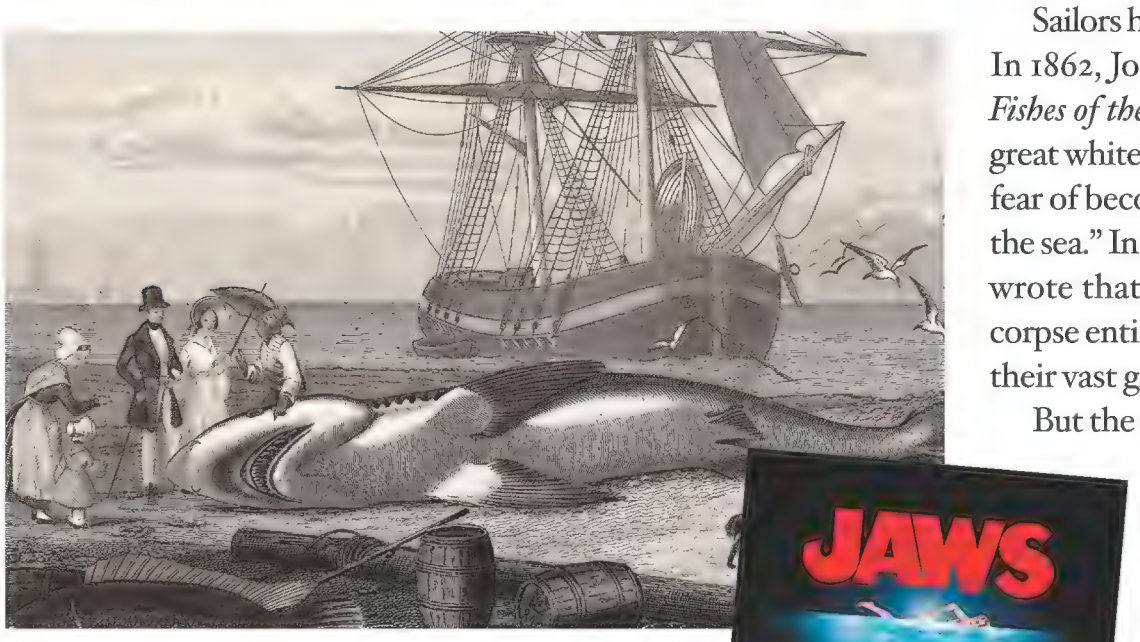
BY PAUL RAFFAELE

IN THE MURKY PREDAWN LIGHT, our speedboat hurdles across Cape Town, South Africa's False Bay. A fierce wind whips the seas, pitching our 26-foot craft and sending an eerie scream across the white-tipped waves. We are hoping to come face to face with one of the earth's most feared predators: the great white shark. Alison Kock, a marine biologist, has made this journey more than 500 times since 1999, striving to unlock the shark's many mysteries.

We approach a flat, rocky island a quarter-mile long and crowded with about 60,000 Cape fur seals. "They want to go to sea to feed, but they're afraid of the white sharks," Kock says. The hungry seals dive into the water in a desperate swim for their feeding grounds 40 miles out in the bay. They must run a gantlet of great whites waiting for them just off Seal Island.

The attacks begin a few minutes later. A 3,000-pound great white explodes out of the water. In midair the shark lunges at a seal and flips back into the water with a mighty splash. Moments later another shark breaches and bites a seal. We speed to the spot, in time to see a pool of blood. Scores of gulls hover above, screeching in excitement, then swoop down to gobble up any leftovers.

During an hour and a half, we witness ten great white sharks hurtling out of the water to grab seals. As the rising sun brightens the sky, the attacks stop.



Great white sharks have been frightening people for centuries (an 1830s woodcut), but the 1975 hit film (inset) sealed the predators' reputation. Scientists say great whites have been misunderstood.

"That's it for today," Kock says. "The great whites only attack in the hour after dawn. We think it's because once there's enough sunlight, the seal can see the shark coming at it from below and escape."

Despite this awesome display of predator power, Kock and other researchers claim that the shark has been defamed: its reputation as a ruthless, mindless man-eater is undeserved. In the past decade, Kock and other shark experts have come to realize that sharks rarely hunt humans—and that the beasts are sociable and curious. Unlike most fish," Kock says, "white sharks are intelligent, highly inquisitive creatures."

PERHAPS THE LARGEST GREAT WHITE SHARK ever caught was off Malta, in the Mediterranean Sea, in 1987. It was reported to be 23 feet long and weigh 5,000 pounds. (Many scientists are skeptical and put the maximum length for a great white at closer to 21 feet.) A sea turtle, a blue shark and a dolphin, and a bag full of garbage were found in the giant's innards.

The great white shark is a top predator throughout the world's temperate and subtropical waters. It's found most commonly off South Africa, New Zealand, Australia and the United States, where most sightings occur in the waters off California and the mid-Atlantic coast. With its torpedo shape and heavily muscled tail, a great white can swim 15 miles per hour or faster when attacking. It has about 240 serrated teeth in up to five rows.

No one has seen great white sharks mate. Males are distinguished by a pair of sperm-delivery organs called claspers that extend from the pelvic fins. After mating, eggs hatch inside the female's uterus. Gestation takes at least a year, then 2 to 12 babies are born. In some shark species, the strongest fetuses eat their weaker brothers and sisters in the womb; no one knows whether great whites do so.

Sailors have feared great white sharks for centuries. In 1862, Jonathan Couch wrote in his *History of the Fishes of the British Isles* that in the West Indies, the great white "is the dread of sailors who are in constant fear of becoming its prey when they bathe or fall into the sea." In 1812 the British zoologist Thomas Pennant wrote that "in the belly of one was found a human corpse entire, which is far from incredible considering their vast greediness after human flesh."

But the great white shark entered the landlubbers' pantheon of most terrifying creatures only in 1971, when a great white approached a dive cage in a documentary called *Blue Water, White Death*. The film inspired American novelist Peter Benchley to write the book *Jaws*, about a great white terrorizing a New Jersey seaside community. Heart-thumping fear spread around the world in 1975 when a then little-known director, Steven Spielberg, directed a movie based on the novel. *Jaws* was the first film to earn $100 million at the box office, and it launched the era of the summer blockbuster.

Leonard Compagno, one of the foremost experts on sharks, helped design the mechanical great white used in the movie. "When they made it a huge male with its characteristic claspers, I told them they'd got it wrong because the biggest great whites were females. The art director told Spielberg, who brushed aside my objection. He wanted it to be an enormous male great white, and that was that." Compagno knew the movie was a "monster gig," but he did not anticipate how seriously people would take it. "The movie great white scared the hell out of people, and made the shark much feared," he says. In reality, great whites "rarely bother people, and even more rarely attack them."

PAUL RAFFAELE *was injured by a bomb blast in Afghanistan in April while on assignment for* SMITHSONIAN. *He is expected to make a full recovery.*

SCIENCE PHOTO LIBRARY / PHOTO RESEARCHERS; KOBAL COLLECTION / PICTURE DESK; PP. 36-37 BRANDON COLE

South Africa has one of the world's highest concentrations of great white sharks (a doomed Cape fur seal near Seal Island). But California holds the record for the most attacks on humans.

CHRIS FALLOWS

"UNLIKE MOST FISH," KOCK SAYS, "WHITE SHARKS ARE INTELLIGENT, HIGHLY INQUISITIVE CREATURES."

Compagno, 64, has run the Shark Research Centre of the Iziko South African Museum for more than two decades. He became fascinated with the animals as a child growing up near Monterey Bay, California, and studied them as a graduate student at Stanford. He took a job in South Africa in 1984, during the apartheid era, and "got a bit of flack from a few scientific colleagues," he says. But South Africa is one of the best places to study great whites.

Much of his work entails observing behavior, and he's found the fish to be a surprisingly intelligent creature. "When I'm on the boat, they'll pop their heads out of the water and look me directly in the eye," he told me. "Once, when there were several people on the boat, the great white looked each person in the eye, one by one, checking us out. They feed on large-brained social animals such as seals and dolphins, and to do this you have to operate on a level higher than a simple machine mentality of an ordinary fish."

Compagno has also found that they are not lone hunters but social animals. When great whites gather, he says, "some are assertive, others relatively timid. They body-slam, gape or carefully bite each other in dominance displays." Fishermen have told him they've seen the sharks hunt cooperatively. "One great white will draw the attention of a seal, allowing another to come from behind and ambush it," Compagno says.

And he swears that the sharks display curiosity. Seals, penguins and other animals sometimes have scars from shark bites; Compagno says the bites were investigative, not predatory. One of his students has watched a shark catch a seal in its mouth and toss it into the air repeatedly. Alison Kock says she saw a great white sneak up below a bird floating on the water, "gently" grab the bird in its mouth and swim around the boat. A few seconds later the bird resurfaced and flew off, hardly the worse for wear. Compagno even says that "some 'shark attacks' on humans by white sharks seem playful; I interviewed two divers here who were grabbed lightly by the hand by a white shark, towed a short distance and then released with minimal injury."

THE GREAT WHITE SHARK attacks near Seal Island end as suddenly as they begin. The sea gulls stop screeching. Kock drops anchor and chums the water with a slurry of pulped sar-

Some scientists criticize the practice of chumming the water to attract sharks for tourists (a fish slurry above divers off Australia), but tour operators defend it. The shark-diving business is booming.

I SHOULD KNOW BETTER, BUT I CAN'T HELP IT: ON THE TIP OF MY TONGUE IS THE THEME FROM *JAWS*.

dines and tuna. "Great whites can smell this from a mile away and come because they think there's been a kill." She baits a hook with a large tuna head and throws it into the water.

"Shark!" she shouts, and I see an enormous dark fin slice through the water near the boat. I should know better, but I can't help it: on the tip of my tongue is the *Jaws* theme music, the heart-pumping *duh-dum, duh-dum, duh-dum*. Kock says that it's a female, about 11 feet long. Swimming with graceful power, the shark follows the tuna head as Kock's assistant pulls it to the boat before the shark can get a bite. Kock balances against the side wielding a modified spear gun with a blue electronic tag at the end. The shark pulls away untouched. It skirts the boat, swims to the other side, turns and—I swear—looks me straight in the eye.

The shark returns an hour later, and Kock is finally able to inject the tag on its right side, below the dorsal fin. The great white body-slams the boat, shaking it, then swims away.

Kock has tagged 75 great white sharks with electronic markers since 2003. She had divers set 35 detectors in the seabed around False Bay. Whenever a tagged shark passes within about 1,600 feet of the instruments, they record the time, date and identity of the shark. It's mid-September, almost summer in the Southern Hemisphere, and her research has shown that the great whites will soon abandon Seal Island and move closer to shore, patrolling the water just beyond the breakers.

Another great white approaches the boat but doesn't come close enough to be tagged, and Kock decides to check the inshore waters. We approach a beach where dozens of people are swimming. Kock spots a huge silhouette below the surface and steers the boat closer. "She's almost 15 feet long and weighs more than 4,000 pounds," Kock cries with excitement. It's the second-largest great white shark she has seen this year.

I stare, barely able to absorb the animal's immensity. Kock follows the shark, but it pulls away. After trying for an hour to tag the beast, Kock gives up. It's the one that got away.

DESPITE SCIENTISTS' YEARS OF RESEARCH on great white shark biology (see sidebar, opposite), they still have lots to learn about behavior—and migratory patterns. In 2003, Wildlife Conservation Society researchers attached an electronic tag to a shark named Nicole off the coast of South

PACIFIC STOCK / PHOTOLIBRARY

Africa. The tag was programmed to record the shark's position for 99 days before detaching. When the tag surfaced off the coast of Western Australia—roughly 6,800 miles away—it was the first record of a great white shark migrating between oceans. Nicole was apparently on a round-trip journey, because in August 2004, researchers spotted her distinctive dorsal fin back in South African waters.

A recent study of California's great white sharks found similar patterns. Some sharks make annual journeys to the Hawaiian Islands and back to the same beaches where they were tagged. Oddly, though, even more of them swim to a spot about halfway to Hawaii, a shark hot spot previously unknown to researchers. Stanford marine biologist Salvador Jorgensen calls it "the white shark café." He isn't sure whether sharks gather there to eat, to mate or for some other reason entirely.

Another surprise to come out of recent tagging studies is that great whites from California and Hawaii do not mingle with those from South Africa and Australia. No one knows why. This could pose a problem for conservation efforts: if one population shrinks, it cannot be replenished from the other side of the ocean.

Great white sharks' numbers have plummeted; along the U.S. Atlantic coast, for instance, the population has declined by more than 75 percent in the past two decades. The main culprits are commercial net and long-line fishing, which inadvertently snare sharks; fin hunters, who sell their hauls for shark fin soup; and the illegal international trade in great white jaws and teeth. "I've seen the bodies of great whites with their jaws cut out," says Mike Rutzen, who runs a shark-diving business in South Africa. "A jaw with all its teeth can fetch $25,000 on the black market in the U.S., and a single tooth can cost $500." Shark fin sells for $300 or more per pound. Hunters usually cut off the dorsal and pectoral fins and toss the body back in the water. Unable to swim, the shark can't pass oxygen-rich water through its gills and drowns.

South Africa was the first country to ban commercial hunting of great white sharks, in 1991, followed by Namibia, Australia, the United States, Malta and New Zealand. The great white was listed as "vulnerable" by the United Nations in 2000, and in 2004 the Convention on International Trade in Endangered Species (CITES) outlawed most international trade in its jaws, teeth, fins or meat. California and Florida have placed a total ban on killing the species, frustrating sports fishermen. Not that the great white should be regarded as much of a trophy. "The great white is one of the easiest of fishes to catch," says Rutzen. The sharks will follow bait right up to a boat.

ALISON KOCK SAYS great white sharks are drawn toward land during the summer when other fish arrive with the warm currents. She shows me a photograph of a beach where I have gone swimming in Cape Town. A 16-foot female great white

BRANDON COLE

Sense and Sensitivity

Great whites have tiny brains but powerful sensory organs

THE SCIENTIFIC NAME GIVEN to great white sharks in the 19th century—*Carcharodon carcharias*, from the Greek for "jagged tooth"—reminds us that these creatures were defined by their most fearsome feature long before the movie *Jaws*. But great white sharks are more than just masterful masticators; they are equipped with powerful sensory systems that equal or surpass our own in many respects.

Researchers rarely get a good look at a great white's brain; specimens are hard to come by, and a dissection must be done during the hours between death and decomposition. In 1992, biologists Leo Demski of the University of South Florida and R. Glenn Northcutt of the University of California at San Diego obtained a fresh great white's head from a Florida fisherman. They were surprised at the "relative smallness" of the brain, which weighed less than an ounce and a half. But they found that 18 percent of it was devoted to smell, the highest percentage among sharks. That explains why dropping pieces of not-so-fresh fish into the water, as researchers and tour guides often do, is a good way to attract great whites.

The ampullae of Lorenzini (dark dots on a great white's snout) can detect a heartbeat.

Great whites also have excellent vision. Inside their retinas, they have a pattern of cone-shaped cells (which detect color) and rod-shaped cells (which detect contrast in low light conditions) comparable to that in humans. They also have a reflective layer behind their retina—the same thing that makes cats' eyes appear to glow in the dark—which bounces extra light to the retinal cells. This allows the sharks to see in the dimness of the deep ocean.

Great whites and other sharks lack external ears, but that doesn't mean their world is silent. They have inner ears on either side of their head, and a system of hair-lined tubes called a "lateral line" runs beneath the skin of their flanks, making their body sensitive to vibrations caused either by sound or movement in the water.

A. Peter Klimley of the University of California at Davis, who has studied sharks for 36 years, says a great white operates from a "hierarchy of senses" depending on its distance from potential prey. "At the greatest distance, it can only smell something, and as it draws closer it can hear, and then see it," Klimley explains. "When the shark gets really close, it can't actually see the prey right under its snout because of its eye positioning, so it uses electroreception."

Electroreception is a kind of "sixth sense" found in some aquatic animals. Sharks and rays use an organ called the ampullae of Lorenzini, named after the Italian scientist who discovered it in 1678. Tiny holes in the shark's snout lead to a network of narrow canals beneath the skin that are filled with a jelly that conducts weak electrical currents—the sort generated by the heartbeat or other muscle movements of a seal or swimmer.

Despite all these sensory tools, many scientists say that great whites don't always know what they're biting into. They often release an animal after biting it once, particularly if it is a relatively low-fat creature like a sea otter or a human, instead of a high-fat seal or sea lion.

"It may be a textural discrimination [of fat], more than what we would call taste. . . . We once took a seal and stripped the fat off it and put it all in the water. The shark ate the fat, but not the rest of the body," Klimley says. "They are actually very discriminating predators." —AMANDA BENSEN

lies next to Kock's boat, disturbingly close to children playing in the shallows. The researchers never chum near swimmers, but find sharks with the help of spotters on coastal mountains who scan the waters with binoculars. (The spotters' primary job is to alert lifeguards when a shark is near.) "It's very rare for great whites to attack humans as prey," Kock says. "Imagine the hundreds of thousands of swimmers here each summer, and then count the number of attacks. Over the past few years you can count them on one hand."

Three years ago, about 20 yards from the Cape Town shoreline, Tyna Webb, 77, was taking her morning swim, as she had done for 17 years. "From the beach I saw the fin, then the whole shark coming out of the water," a witness to the attack later reported. All that was found was Webb's red bathing cap. A few years earlier, only three of four South African spear-fishermen who went underwater together resurfaced. Compagno examined the missing diver's wet suit when it was recovered. "The tear marks indicated it was a great white shark that had somehow cut him out of the suit and devoured him," Compagno says.

There's still plenty to learn about sharks (Alison Kock prepares a fin tag, left; Compagno stands amid jaws of a 50-foot-long extinct shark called megalodon).

There have been 236 great white shark attacks on humans recorded since 1876. About one-third have taken place in California waters. This past April, triathlete David Martin was killed by a great white north of San Diego. One attack that particularly haunts me happened in Australia in 1993. Newlyweds John and Deborah Ford were scuba diving at a seal rock 400 miles north of Sydney. They were decompressing a few yards below the surface when John saw a 16-foot great white heading toward his wife. He pushed her out of the way, and the shark swallowed him.

Despite this grisly and disturbing history, Compagno says great whites intentionally attack humans even less frequently than the statistics suggest. Compagno says many "incidents" (a term he prefers to "attacks") are "bite and release." He thinks the shark is trying to get a better look at the strange creature in the water. According to the International Shark Attack File, a record kept by marine biologist George Burgess at the Florida Museum of Natural History, great whites leave the area two-thirds of the time after the first bite. According to his records, over 80 percent of people supposedly attacked by great whites in the 1990s survived. "If the great whites really attacked the people listed on the file, hardly any would have survived," says Compagno.

One encounter that was widely referred to as an attack—but almost certainly wasn't—took place this past October in Australia. A tourist on a kayak claimed she'd beaten an attacking great white shark off with a paddle. She required four stitches. "If the great white attacked her, she'd be mincemeat," says Compagno. The wound was probably caused by the sharp scales on the shark's skin brushing against the woman's arm.

THE HAMLET OF GANSBAAI, 100 miles southeast of Cape Town, bills itself as the great white shark capital of the world. Mike Rutzen's family—including his mother, sister, brothers, niece and nephews—opened a cage-diving business here in 2001. Brad Pitt has taken the plunge with the Rutzens three times; Leonardo DiCaprio and Britain's Prince Harry have also taken to the Rutzen cages.

But there are only excited tourists, Rutzen, the crew and me aboard the *Barracuda* today. Rutzen is famous around Gansbaai for diving with great whites without a cage. "The first time I was really scared," he tells me as we head out through a mist, "I was right by the boat and she came close to me. I nervously prodded her away with a spear gun. She swam away a few yards, turned and surged back at me. She thrust her face at mine and opened wide her enormous mouth to show me her teeth, and swam away. She was saying, 'Don't do that again.'"

A film shot for an "Animal Planet" TV program shows Rutzen with eight curious-looking great whites circling him. He strokes the nose of one, prompting it to open its mouth wide just inches from his face. It is a reflex response, not a threat display. Then the sharks are apparently scared away by the arrival of a larger 15-foot female. The female swims around Rutzen a few times, seemingly checking him out. He grabs hold of her dorsal fin, and she tows him about 100 yards underwater.

I have no intention of joy riding on the back of a great white shark. But I do plan to offer myself at close range to see if the animals consider me prey. We drop anchor about a mile offshore from a popular beach. Six other dive boats idle nearby, and within 30 minutes every one of them has a curious great white hovering around it. Rutzen's nephew, Morné Hardenberg, throws out a tuna head attached to a rope while two crew members pour scoops of chum into the water.

JOHN YELD; SAM REINDERS / AURORA SELECT

It may be hard to fathom, but many great white encounters with humans are investigative, not predatory. (A great white attacks a seal decoy in False Bay.) They're just curious, Compagno says.

BRANDON COLE

IT'S NOT MUCH OF A TROPHY: "THE GREAT WHITE IS ONE OF THE EASIEST OF FISHES TO CATCH."

"Shark!" Rutzen cries as a huge triangular fin breaks the water about ten yards from the boat. The great white makes straight for the tuna, and Hardenberg draws the shark up to the boat before pulling the bait on board.

Feeding wild sharks is illegal in the United States, and conservationists are pushing to ban the practice in South Africa. "Sharks are trainable animals," says Florida marine biologist Burgess. "They learn to associate the humans and the sound of boat engines with food, just like Pavlov's dog and the bell. So what we really have then is an underwater circus." An Austrian tourist diving—without a cage—in chummed waters in the Bahamas was bitten on the leg by a bull shark this past February. He died of blood loss the next day, the first death Burgess says can be attributed to shark feeding.

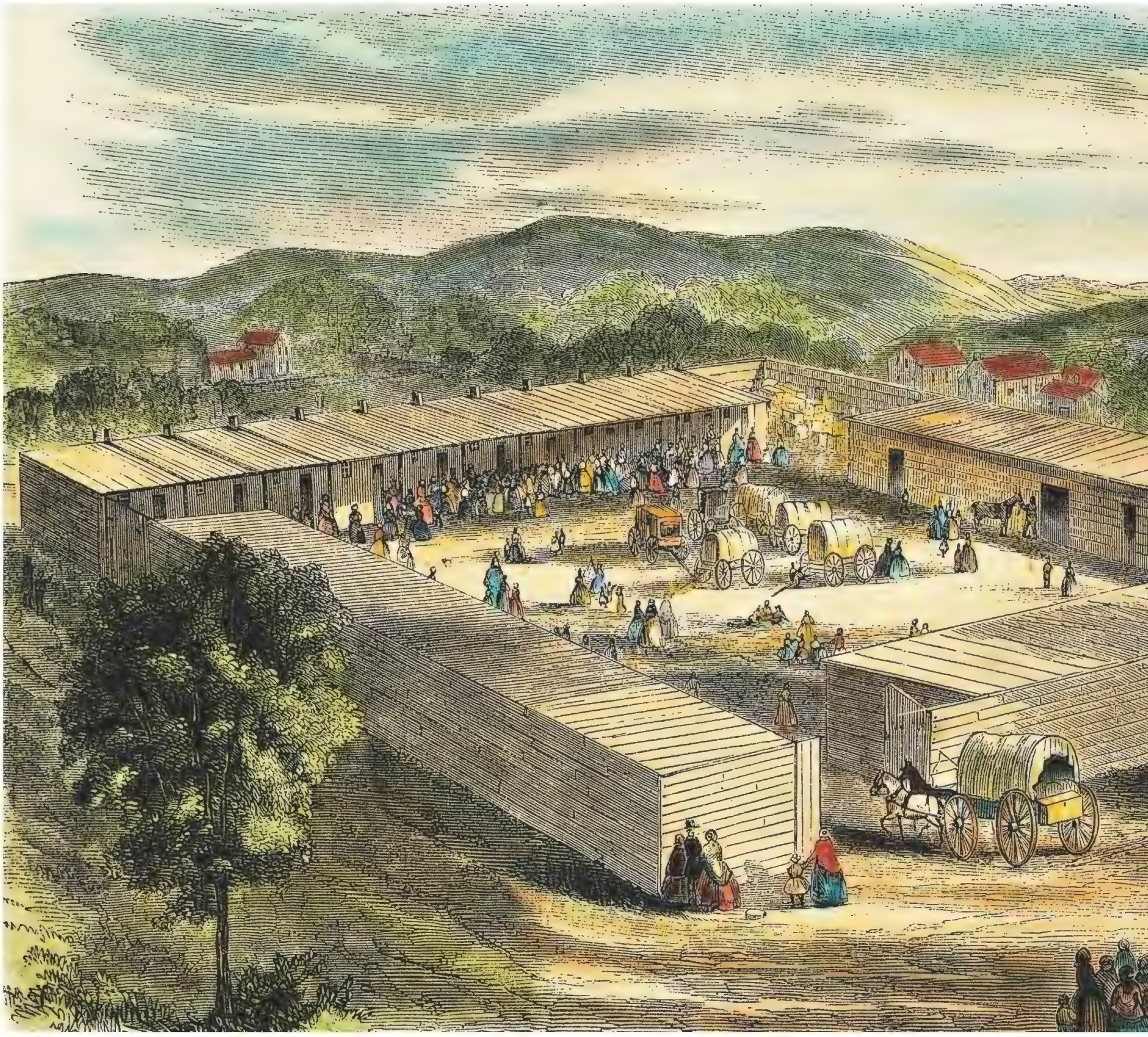
Rutzen says that his crew members never actually feed sharks: they always pull their tuna-head bait into the boat before a shark can get it, and he says the small bits of flesh in the chum fall to the seafloor. But there's no question that the prospect of food whets a shark's appetite.

I scramble into the dive cage with three other shark watchers. We duck our heads underwater to watch the shark as it chases the bait. As it swims by us, its snout bumps against the cage. I stand up on a bar across the middle of the cage, my body halfway out of the water. Rutzen yells "Shark!" and a great white breaks the surface with its snout and looks directly at me. For a few moments I feel real terror. Hardenberg flings the bait again, and the shark follows it to the boat, coming so close that I can reach down and touch its rough skin. The shark doesn't notice; it's focused on the tuna. Three more great whites arrive, attracted by the chum. They follow the bait, ignoring the bigger and tastier meal—me—just inches from their giant jaws.

One shark bucks the system. For the fifth time it follows the tuna head toward the boat. When Hardenberg yanks the tuna aboard, the shark body-slams the small cage, almost knocking me off my perch. As I cling to the bars, it swats at me with its enormous tail, barely missing my head.

I don't think the shark wanted to eat me; the tuna head smelled and moved more like shark food than I did. I stay at the top of the cage as the great whites make ten more lunges at the boat. It's a thrill. It's terrifying. But it's somehow comforting that the sharks don't seem to think of me as prey.

Watch a video of the misunderstood great white shark at Smithsonian.com/sharks



ON JULY 24, 1847, *a wagon rolled out of a canyon and gave Brigham Young, president of the Church of Jesus Christ of Latter-day Saints, his first glimpse of the Great Salt Lake Valley. That swath of wilderness would become the new Zion for the Mormons, a church roughly 35,000 strong at the time.*

"If the people of the United States will let us alone for ten years," Young would recall saying that day, "we will ask no odds of them." Ten years to the day later, when the church's membership had grown to about 55,000, Young delivered alarming news: President James Buchanan had ordered federal troops to march on the Utah Territory.

By then, Brigham Young had been governor of the territory for seven years, and he had run it as a theocracy, giving church doctrines precedence in civil affairs. The federal troops were escorting a non-Mormon Indian agent named Alfred E. Cumming to replace Young as governor and enforce federal law. In their long search for a place to settle, Mormons had endured disastrous confrontations with secular authorities. But this was the first time they faced the prospect of fighting the U.S. Army.

On June 26, 1858, one hundred fifty years ago this month,

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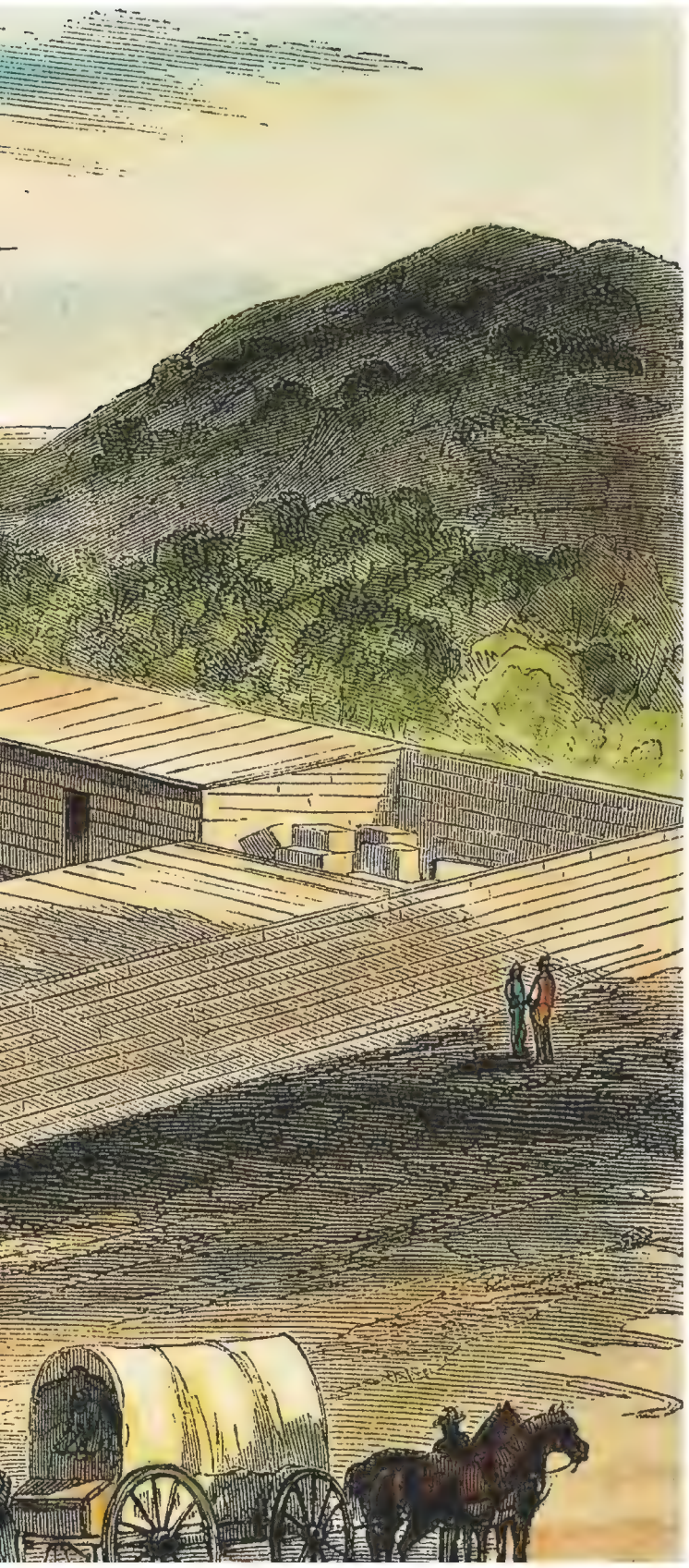

The BRINK *of* WAR

One hundred fifty years ago, the U.S. Army marched into Utah prepared to battle Brigham Young and his Mormon militia

BY DAVID ROBERTS

James Buchanan (above left) and Brigham Young (above right) faced off over who would govern the Utah Territory (left: a Mormon encampment in Provo, 1858).

a U.S. Army expeditionary force marched through Salt Lake City—at the denouement of the so-called Utah War. But there was no war, at least not in the sense of armies pitched in battle; negotiators settled it before U.S. troops and Utah militiamen faced off. On June 19, the *New York Herald* summarized the non-engagement: "Killed, none; wounded, none; fooled, everybody."

In retrospect, such glibness seems out of place. The Utah War culminated a decade of rising hostility between Mormons and the federal government over issues ranging from governance and land ownership to plural marriage and Indian affairs, during which both Mormons and non-Mormons endured violence and privation. The tension was reflected in the fledgling Republican Party's 1856 presidential platform, which included a pledge to eradicate the "twin relics of barbarism—polygamy and slavery." To look back at this episode now is to see the nation at the brink of civil war in 1857 and 1858—only to pull back.

"The Utah War was catastrophic for those who suffered or died during it, and it was catalytic in advancing Utah along the slow but eventual path to statehood," says Richard E. Turley Jr., assistant church historian and recorder of the LDS Church.

Allan Kent Powell, managing editor of the *Utah Historical Quarterly*, notes that Abraham Lincoln warned, in 1858, that "a house divided against itself cannot stand," referring to the United States and slavery. "The same comment could have

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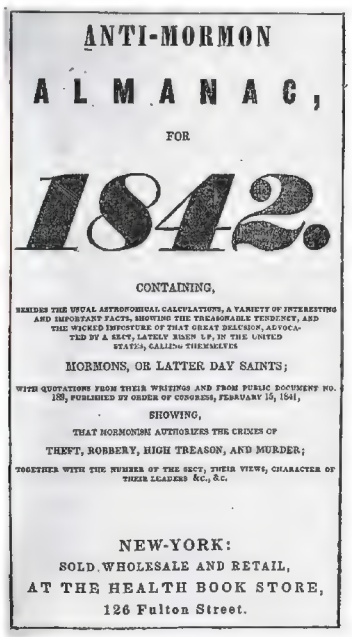
been applied to Utah," says Powell. "Just as the nation had to deal with the issue of slavery to ensure its continuation, so did the Territory of Utah have to come to an understanding and acceptance of its relationship with the rest of the nation."

The nation was unable to put off its reckoning over slavery. But the resolution of the Utah War bought the LDS Church time, during which it evolved as a faith—renouncing polygamy in 1890, for example, to smooth the way to Utah statehood—to become the largest home-grown religion in American history, now numbering nearly 13 million members, including such prominent Americans as Senator Orrin Hatch of Utah, Senate majority leader Harry Reid of Nevada and hotelier J. W. Marriott Jr. At the same time, anti-Mormon bias persists. Last December, in an effort to make voters more comfortable with his Mormon faith, former Massachusetts governor Mitt Romney, then a Republican presidential contender, declared like the Catholic John F. Kennedy before him: "I am an American running for president. I do not define my candidacy by my religion." In a Gallup Poll taken after Romney's speech, 17 percent of respondents said they would never vote for a Mormon. Roughly the same percentage answered similarly when Romney's father, Michigan Governor George Romney, ran for president in 1968.



ANTI-MORMON

ALMANAC,

FOR

1842.

CONTAINING,

BESIDES THE USUAL ASTRONOMICAL CALCULATIONS, A VARIETY OF INTERESTING AND IMPORTANT FACTS, SHOWING THE TREASONABLE TENDENCY, AND THE WICKED IMPOSTURE OF THAT GREAT DELUSION, ADVOCATED BY A SECT, LATELY RISEN UP, IN THE UNITED STATES, CALLED THEMSELVES

MORMONS, OR LATTER DAY SAINTS;

WITH QUOTATIONS FROM THEIR WRITINGS AND FROM PUBLIC DOCUMENT NO. 189, PUBLISHED BY ORDER OF CONGRESS, FEBRUARY 15, 1841,

SHOWING,

THAT MORMONISM AUTHORIZES THE CRIMES OF

THEFT, ROBBERY, HIGH TREASON, AND MURDER;

TOGETHER WITH THE NUMBER OF THE SECT, THEIR VIEWS, CHARACTER OF THEIR LEADERS &c., &c.

NEW-YORK:
SOLD WHOLESALE AND RETAIL,
AT THE HEALTH BOOK STORE,
126 Fulton Street.

Joseph Smith (above) founded the Church of Jesus Christ of Latter-day Saints in 1830. Conflicts with outsiders arose quickly (above right: a tract rails against the church as a "wicked imposture").

Even now, issues rooted in the era of the Utah War linger. Last September, when the LDS Church formally expressed regret for the massacre of some 120 unarmed members of a wagon train passing through Utah on September 11, 1857, the *Salt Lake Tribune* published a letter comparing the events to the terrorist attacks of September 11, 2001. A raid this past April by state authorities on a fundamentalist Mormon compound in Texas returned the subject of polygamy to the headlines (though the sect involved broke from the LDS Church more than 70 years ago).

"In the late 1850s, Mormons believed that the world would end within their lifetimes," says historian David Bigler, author of *Forgotten Kingdom: The Mormon Theocracy in the American West, 1847-1896*. In addition, he says, "they believed the forefathers who wrote the American Constitution had been inspired by God to establish a place where His kingdom would be restored to power. The Mormons believed their own kingdom would ultimately have dominion over all the United States." At the same time, the American nation was pursuing a "manifest destiny" to extend its domain westward all the way to the Pacific. The continent was not large enough to accommodate both beliefs.

THE CONFLICT HAD BEEN BUILDING almost from the moment Joseph Smith, a religious seeker, founded his church in Palmyra, New York, in 1830. Where other Christian churches had strayed, Smith preached, the LDS Church would restore the faith as conceived by Jesus Christ, whose return was imminent. The next year, Smith moved with about 75 congregants to Ohio and sent an advance party to Missouri to establish what they believed would be a new Zion.

In the agrarian democracy Americans were building, both land and votes mattered. Non-Mormons felt threatened by the Mormons' practices of settling in concentrated numbers and voting as a bloc. The Missouri Mormons were forced to relocate twice in the mid-1830s. In Ohio, an anti-Mormon mob tarred and feathered Smith in 1832, and he left the state in 1838 after civil lawsuits and a charge of bank fraud followed the failure of a bank he had founded. By the time he arrived in Missouri that January, non-Mormons were assaulting Mormons and raiding their settlements; a secret Mormon group called the Sons of Dan, or Danites, responded in kind. That August, Missouri Governor Lilburn Boggs issued an order to his state militia directing that the Mormons "be exterminated or driven from the State for the public peace." Two months later, 17 Mormons were killed in a vigilante action at a settlement called Haun's Mill.

Determined to establish a new Zion beyond American laws and anti-Mormon mobs, church leaders looked toward the Great Salt Lake Valley.

The Mormons moved next to Illinois, founding the town of Nauvoo there in 1840 under a charter that gave the city council (which Smith controlled) authority over local courts and militia. This settlement grew to about 15,000 people, making it the biggest population center in the state. But in 1844, authorities jailed Smith in the town of Carthage after he destroyed a Nauvoo newspaper that had alleged he was mismanaging the town and had more than one wife. At that point, Smith's polygamy was acknowledged only to the LDS Church's senior leaders. In a raid on the jail, an anti-Mormon mob shot the church founder to death. He was 38.

NATIONAL GALLERY OF ART / BRIDGEMAN ART LIBRARY; AMERICAN ANTIQUARIAN SOCIETY / BRIDGEMAN ART LIBRARY

"Few episodes in American religious history parallel the barbarism of the anti-Mormon persecutions," historian Fawn Brodie wrote in her 1945 biography of Smith. At the same time, she added, the early Mormons' relationships with outsiders were characterized by "self-righteousness" and an "unwillingness to mingle with the world." To non-Mormons in Illinois, Brodie wrote, "the Nauvoo theocracy was a malignant tyranny that was spreading as swiftly and dangerously as a Mississippi flood." Amid continuing harassment in Illinois, the Mormons prepared to leave.

After Smith's death, the LDS Church's ruling council, the Quorum of the Twelve Apostles, took control of church affairs. The lead apostle, Brigham Young, a carpenter from Vermont and an early convert to Mormonism, eventually succeeded Smith. In February 1846, he led the beginnings of an exodus of some 12,000 Mormons from Illinois, determined to establish their faith beyond the reach of American laws and resentment. Brigham Young biographer Leonard J. Arrington has written that Young and other church leaders knew about the Great Salt Lake Valley from trappers' journals, explorers' reports and interviews with travelers familiar with the region.

At the time, most of what would become the American Southwest belonged to Mexico, but Young believed that that nation's hold on its northern frontier was so tenuous that the Mormons could settle there free from interference. In the spring of 1847, he led an advance party of 147 from an encampment in Nebraska to the Great Salt Lake Valley, arriving that July. Over the next two decades, some 70,000 Mormons would follow; the grueling journey would be one of the defining experiences of the LDS Church.

In February 1848, Mexico sealed its defeat in the Mexican-American War by signing the Treaty of Guadalupe Hidalgo, ceding to the United States what is now California, Nevada, Utah, Texas and parts of Arizona, New Mexico, Colorado and Wyoming. Just six months after arriving in their new Zion, the Mormons found themselves back under the authority of the United States.

To preserve self-rule, church leaders quickly sought official status, petitioning Congress in 1849 first for territorial status, then for statehood. The land they sought was vast, running from the Rockies to the Sierra Nevada and from the new border with Mexico all the way to present-day Oregon.

MAP: GUILBERT GATES

DAVID ROBERTS *is the author of the forthcoming* Devil's Gate: Brigham Young and the Great Mormon Handcart Tragedy.

Congress, guided in part by the struggle between forces opposing and condoning slavery, designated a Utah Territory, but not before reducing the area to present-day Utah, Nevada, western Colorado and southwestern Wyoming.

Territorial status gave the federal government greater authority over Utah affairs than statehood would have. But President Millard Fillmore inadvertently set the stage for a clash with his choice for the new territory's chief executive. In 1850, acting partly in response to lobbying from a lawyer named Thomas L. Kane, a non-Mormon who had advised Mormon leaders in previous ordeals, Fillmore named Brigham Young governor of the new Utah Territory.

YOUNG RAN THE UTAH TERRITORY much as Smith had run Nauvoo, and conflicts between religious and secular authorities soon re-emerged. The Mormon leaders were suspicious of both the character and intent of federal appointees, such as a judge who was found to have abandoned his wife and children in Illinois and brought a prostitute to Utah. And over the next seven years, a succession of federal officers—judges, Indian agents, surveyors—came to the territory only to find that the governor would circumvent or reverse their decisions.

Young "has been so much in the habit of exercising his will which is supreme here, that no one will dare oppose anything he may say or do," Indian agent Jacob Holeman wrote to his superior in Washington, D.C. in 1851—in effect going over Young's head (Young was also the territory's su-

perintendent of Indian affairs). Surveyor General David Burr reported that Young told him federal surveyors "shall not be suffered to trespass" on Mormon lands. Through the mid-1850s, federal appointees returned East frustrated or intimidated or both, and some of them wrote books or articles about their travails. Anti-Mormon sentiment spread, inflamed particularly by reports of polygamy.

By then, the practice of plural marriage had expanded beyond Joseph Smith's inner circle, and word of it had been passed by non-Mormon emigrants passing through Utah, where the evidence was in plain view. "During the first few years after their arrival in Utah," writes Young biographer M. R. Werner, "the fact that the Mormons practiced polygamy was an open secret."

The Mormons' embrace of plural marriage was based on a revelation that Smith said he had received. (It was written down in 1843, but most historians agree that Smith had begun taking multiple wives earlier.) With the example of polygamous biblical patriarchs such as Abraham and Jacob in mind, Smith concluded that "the possession of more than one wife was not only permissible, but actually necessary for complete salvation," Werner writes. Brigham Young, who took his first plural wife in 1842, after 18 years of monogamy, maintained that he had been a reluctant convert: "I was not desirous of shrinking from any duty, nor of failing in the least to do as I was commanded," he wrote in a reminiscence that would be collected in the church compendium *Journal of Discourses*, "but it was the first time in my life that I had desired the grave." (By the time he died, at age 76 in 1877, he had taken 55 wives but shared no "earthly life" with 30 of them, according to Arrington.) For years Young and other church leaders had dismissed allegations of plural marriages as calumnies circulated by enemies, but by the early 1850s, such denials were no longer plausible.

On August 29, 1852, at a general conference of Mormons in Salt Lake City, the church leadership publicly acknowledged plural marriage for the first time. Orson Pratt, a member of the Quorum of the Twelve Apostles, delivered a lengthy discourse, inviting the members to "look upon Abraham's blessings as your own, for the Lord blessed him with a promise of seed as numerous as the sand upon the seashore." After Pratt finished, Young read aloud Smith's revelation on plural marriage.

The disclosure was widely reported outside the church, and the effect was to quash any hopes the Utah Territory might have had for statehood under Young's leadership. And conflicts between Young's roles as governor of the territory and president of the church would only become more complicated.

IN APRIL 1855, at the Mormons' spring conference, Young called on some 160 men to abandon home, farm and family and head into the wilderness surrounding the Utah settlements to establish missions among the Native Americans there.

In Mormon cosmology, Indians were the descendants of a fallen ancient patriarch, and church officials said they were undertaking the missions to convert tribes on their borders to their faith and to improve their welfare. But Garland Hurt, recently arrived in Utah as an Indian agent, was suspicious. In a confidential letter to the head of the Bureau of Indian Affairs in Washington, he wrote that the missions were actually intended to teach the Indians to distinguish between "Mormons" and "Americans"—a distinction, he added, that would be "prejudicial to the interests of the latter." The few historians who have studied these three missions disagree over their purpose. But irrespective of Young's intentions, correspondence to and from the missionaries, held in LDS archives, reflects rising tension between Mormons and the non-Mormon world.

"I was not desirous of shrinking from any duty . . . ," Young wrote of taking more than one wife, "but it was the first time in my life that I had desired the grave."

Church leaders announced the practice of plural marriage (left: some of Brigham Young's wives) in 1852; reaction beyond Utah's borders thwarted the territory's hopes for statehood.

The first of the missionaries left Salt Lake City in May 1855. One band of men rode more than 350 miles north, into what is now Idaho—beyond Young's legal jurisdiction. Another headed 400 miles southwest—again, beyond Utah's boundaries—to the site of present-day Las Vegas, in the New Mexico Territory. A third pushed 200 miles southeast, to what is now Moab, Utah.

In August, Young wrote to the Las Vegas missionaries, working among Paiutes, to congratulate them on the "prosperity and the success which has thus far attended your efforts" and to exhort them to start baptizing the Indians and to "[g]ain their confidence, love and esteem and make them

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The Mountain Meadows Massacre (above) of 1857 took place as Mormon-U.S. relations were fraying. Paiute Indians (right: c. 1870) were blamed; the LDS Church has acknowledged that Mormon men organized the killings.

feel by your acts that we are their real friends." In all, the missions would report baptizing scores of Indians. (What the Indians made of the ritual was not recorded.)

In an October 1, 1855, letter to a friend, John Steele, an interpreter at the Las Vegas mission, suggested another motive. "If the Lord blesses us as he has done," he wrote, "we can have one thousand brave warriors on hand in a short time to help to quell any eruption that might take place in the principalities." (In 1857, the Utah militia, under Young's command, would number about 4,000.)

The following summer, Young counseled secrecy to another church leader, John Taylor, president of the New York City-based Eastern States Mission (and, eventually, Young's successor as president of the church). "[M]issionaries to the Indians and their success is a subject avoided in our discourses and not published in the '*News*,'" he wrote on June 30, 1856, to Taylor, who was also editing *The Mormon*, a newspaper widely read by Eastern Mormons. "Wherever any thing comes to hand no matter from what source it would be well to carefully look it over and draw your pen through all such as you might deem it wisdom not to publish."

But by 1857, non-Mormon newspapers from New York to California had begun reporting that the Mormons were seeking the Indians' allegiance in case of a clash with the United States. Some accounts were based on briefings from officials who had returned to Washington; others, based on gossip, tended toward a more alarmist tone. For example, on April 20, 1857, the *National Intelligencer*, a Washington newspaper, put the number of the Mormons' Indian allies at 300,000, even though the total Indian population of the Utah Territory appears to have been 20,000 at most. Young would characterize press coverage generally as "a prolonged howl of base slander."

Ultimately, none of the missions lasted. The southeast mission collapsed within four months after a skirmish with Utes; the Las Vegas mission followed, having shifted its focus from conversion to an abortive attempt at mining lead. The northern mission, called Fort Limhi, operated

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among the Bannock, Shoshone and others until March 1858.

By the time Young led his senior aides on an expedition there in April 1857, almost every federal official had left Utah. In Washington, a new president faced his first crisis.

JAMES BUCHANAN, a Democrat, had defeated the Republicans' John Frémont and the Know-Nothings' Millard Fillmore in the 1856 election. He assumed the presidency in March 1857 preoccupied with the fight over whether Kansas would enter the Union as a free or slave state. But within weeks, reports from those who had fled Utah and strident petitions from the territorial legislature for greater influence over the appointment of federal officials turned his attention farther west.

Brigham Young's term as territorial governor had expired in 1854; he had served on an interim basis since. Buchanan, with his cabinet likening the Utah petitions to a declaration of war, decided to replace Young with Alfred Cumming, a former mayor of Augusta, Georgia, who was serving as an Indian-affairs superintendent based in St. Louis. He ordered troops to accompany the new governor west and to enforce federal rule in Utah—but, for reasons that are not clear, he did not notify Young that he was being replaced.

Buchanan assumed the presidency facing the prospect of a conflict over slavery in Kansas. But within weeks his attention was focused farther west.

As a confrontation loomed, Mormon Apostle Heber C. Kimball (left) declared, "I have wives enough to whip out the United States." Army Col. Albert Sidney Johnston (above left) said the Mormons "have placed themselves in rebellion against the Union."

Young found out in July 1857, a month that brought a series of shocks to the Mormons. The *Deseret News* reported that Apostle Parley Pratt had been killed in Arkansas by the estranged husband of a woman Pratt had taken as his 12th wife. Rumors circulated that federal troops were advancing, prompting Apostle Heber C. Kimball to declare, "I will fight until there is not a drop of blood in my veins. Good God! I have wives enough to whip out the United States." Mormons traveling from the Kansas-Missouri frontier brought word that federal troops were, in fact, headed for Utah, leading to Young's announcement on the tenth anniversary of his arrival in the Great Salt Lake Valley.

It was in this heated atmosphere that, six weeks later, a California-bound wagon train that included 140 non-Mormon emigrants, most of them from Arkansas, made camp in a lush valley known as Mountain Meadows, about 40 miles beyond the Mormon settlement of Cedar City. Just before breakfast, according to an account by historian Will Bagley in *Blood of the Prophets: Brigham Young and the Massacre at Mountain Meadows*, a child among the emigrants fell, struck by a bullet. As a party of men with painted faces attacked, the emigrants circled their wagons.

After a five-day siege, a white man bearing a white flag approached the emigrants. Mormons, he told them, had interceded with the attackers and would guarantee the emigrants safe passage out of Mountain Meadows if the Arkansans would turn over their guns. The emigrants accepted the offer.

The wounded and the women and children were led away first, followed by the men, each guarded by an armed Mormon. After half an hour, the guards' leader gave the order to halt. Every man in the Arkansas party was shot from point-blank range, according to eyewitness accounts cited by Bagley. The women and older children fell to bullets, knives and arrows. Only 17 individuals—all of them children under the age of 7—were spared.

For decades afterward, Mormon leaders blamed Paiute Indians for the massacre. Paiutes took part in the initial attack and, to a lesser degree, the massacre, but research by Bagley, Juanita Brooks and other historians has established that Mormons were culpable. Last September, on the 150th anniversary of the event, Mormon Apostle Henry B. Eyring, speaking for the church, formally acknowledged that Mormons in southern Utah had organized and carried out the massacre. "What was done here long ago by members of our Church represents a terrible and inexcusable departure from Christian teaching and conduct," Eyring said. A "separate expression of regret," he continued, "is owed to the Paiute people who have unjustly borne for too long the principal blame for what occurred during the massacre."

In September 1857, Cumming and about 1,500 federal troops were about a month from reaching Fort Bridger, 100 miles northeast of Salt Lake City. Young, desperately needing time to prepare an evacuation of the city, mobilized the Utah militia to delay the Army. Over several weeks, militiamen raided the troops' supplies, burned the grass to deny forage to the soldiers' horses, cattle and mules, even burned Fort Bridger. November snowstorms intervened. Snowbound and lacking supplies, the troops' commander, Col. Albert Sidney Johnston, decided to spend the winter at what was left of the fort. The Mormons, he declared, have "placed themselves in rebellion against the Union, and entertain the insane design of es-

To discuss the Utah War in U.S. history, go to Smithsonian.com/utah

PICTURE HISTORY (2)

Young decreed an exodus of some 30,000 Mormons from northern Utah. A few men remained behind, ready to put houses and barns to the torch.

tablishing a form of government thoroughly despotic, and utterly repugnant to our institutions."

As the spring thaw began in 1858, Johnston prepared to receive reinforcements that would bring his force to almost 5,000—a third of the entire U.S. Army. At the same time, Young initiated what has become known as the Move South, an exodus of some 30,000 people from settlements in northern Utah. Before leaving Salt Lake City, Mormons buried the foundation of their temple, their most sacred building, and planted wheat to camouflage it from the invaders' eyes. A few men remained behind, ready to put houses and barns and orchards to the torch to keep them out of the soldiers' hands. The Mormons, it seemed, would be exterminated or once again driven from their land.

THAT THEY WERE NEITHER is due largely to the intervention of their advocate Thomas Kane. Over the winter of 1857-58, Kane had set out for Utah to try to mediate what was being called "the Mormon crisis." Although his fellow Pennsylvanian President Buchanan did not provide official backing, neither did he discourage Kane's efforts. Kane arrived in Salt Lake City in February 1858. By April, in exchange for peace, he had secured Young's agreement to give way to the new governor. Many in the public, given Buchanan's failure to notify Young and the Army's delayed arrival in Utah, began to perceive the Utah expedition as an expensive blunder undertaken just as a financial panic had roiled the nation's economy.

After Young agreed to give way to a new governor and obey federal laws, the Mormons who had fled their homes returned (above: Young's residence, left, 1869). The Mormons' long accommodation to secular rule included a renunciation of polygamy in 1890.

Buchanan, seeing a chance to end his embarrassment quickly, sent a peace commission west with the offer of a pardon for Utah citizens who would submit to federal laws. Young accepted the offer that June.

That same month, Johnston and his troops marched through the deserted streets of Salt Lake City—then kept marching 40 miles south to establish Camp Floyd, in present-day Fairfield, Utah. With the Army no longer a threat, the Mormons returned to their homes and began a long and fitful accommodation to secular rule under a series of non-Mormon governors. Federal laws against polygamy targeted Mormon property and power through the 1870s and '80s; Wilford Woodruff, the LDS Church's fourth president, issued a formal renunciation of plural marriage in 1890.

"The United States government used polygamy as a wrecking ball to destroy the old theocracy," says historian Bigler. "By 1890, Mormons were hanging on by their fingernails. But when Wilford Woodruff delivered his manifesto repudiating polygamy, he went further: he said that from now on, Mormons would obey the law of the land." Statehood for Utah followed in 1896. Their dreams of dominion over, the Mormons began to enter the American fold.

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DIAMONDS

These rocks don't lose their shape: thanks to recent advances, scientists can grow gems (from Apollo, this page) and industrial diamonds in a matter of days.

ON DEMAND

LAB-GROWN GEMSTONES ARE NOW PRACTICALLY INDISTINGUISHABLE FROM MINED DIAMONDS. SCIENTISTS AND ENGINEERS SEE A WORLD OF POSSIBILITIES; JEWELERS ARE LESS ENTHUSIASTIC

BY ULRICH BOSER

I'M SITTING IN A FAST-FOOD RESTAURANT OUTSIDE BOSTON that, because of a nondisclosure agreement I had to sign, I am not allowed to name. I'm waiting to visit Apollo Diamond, a company about as secretive as a Soviet-era spy agency. Its address isn't published. The public relations staff wouldn't give me directions. Instead, an Apollo representative picks me up at this exurban strip mall and drives me in her black luxury car whose make I am not allowed to name along roads that I am not allowed to describe as twisty, not that they necessarily were.

"This is a virtual diamond mine," says Apollo CEO Bryant Linares when I arrive at the company's secret location, where diamonds are made. "If we were in Africa, we'd have barbed wire, security guards and watch towers. We can't do that in Massachusetts." Apollo's directors worry about theft, corporate spies and their own safety. When Linares was at a diamond conference a few years ago, he says, a man he declines to describe slipped behind him as he was walking out of a hotel meeting room and said someone from a natural diamond company just might put a bullet in his head. "It was a scary moment," Linares recalls.

PHOTOGRAPHS BY MAX AGUILERA-HELLWEG

Bryant's father, Robert Linares, working with a collaborator who became a co-founder of Apollo, invented the company's diamond-growing technique. Robert escorts me into one of the company's production rooms, a long hall filled with four refrigerator-size chambers bristling with tubes and gauges. As technicians walk past in scrubs and lab coats, I glance inside the porthole window of one of the machines. A kryptonite-green cloud fills the top of the chamber; at the bottom are 16 button-size disks, each one glowing a hazy pink. "Doesn't look like anything, right?" Robert says. "But they will be half-caraters in a few weeks."

In 1796, chemist Smithson Tennant discovered that diamond is made out of carbon. But only since the 1950s have scientists managed to produce diamonds, forging them out of graphite subjected to temperatures as high as 2,550 degrees Fahrenheit and pressures 55,000 times greater than that of earth's atmosphere. But the stones were small and impure. Only the grit was useful, mostly for industrial applications such as dental drills and hacksaw blades. Over the past decade, however, researchers such as Linares have perfected a chemical process that grows diamonds as pure and nearly as big as the finest specimens hauled out of the ground. The process, chemical vapor deposition (CVD), passes a carbon gas cloud over diamond seeds in a vacuum chamber heated to more than 1,800 degrees. A diamond grows as carbon crystallizes on top of the seed.

Robert Linares has been at the forefront of crystal synthesis research since he started working at Bell Labs in Murray Hill, New Jersey, in 1958. He went on to start a semiconductor company, Spectrum Technologies, which he later sold, using the proceeds to bankroll further research on diamonds. In 1996, after nearly a decade working in the garage of his Boston home—no kidding, in the garage, where he'd set up equipment he declines to describe—he discovered the precise mixture of gases and temperatures that allowed him to create large single-crystal diamonds, the kind that are cut into gemstones. "It was quite a thrill," he says. "Like looking into a diamond mine."

Seeking an unbiased assessment of the quality of these laboratory diamonds, I asked Bryant Linares to let me borrow an Apollo stone. The next day, I place the .38 carat, princess-cut stone in front of Virgil Ghita in Ghita's narrow jewelry store in downtown Boston. With a pair of tweezers, he brings the diamond up to his right eye and studies it with a jeweler's loupe, slowly turning the gem in the mote-filled afternoon sun. "Nice stone, excellent color. I don't see any imperfections," he says. "Where did you get it?"

"It was grown in a lab about 20 miles from here," I reply.

He lowers the loupe and looks at me for a moment. Then he studies the stone again, pursing his brow. He sighs. "There's no way to tell that it's lab-created."

MORE THAN ONE BILLION YEARS AGO, and at least 100 miles below the surface of the earth, a mix of tremendous heat and titanic pressure forged carbon into the diamonds that are mined today. The stones were brought toward the surface of the earth by ancient underground volcanoes. Each volcano left a carrot-shaped pipe of rock called kimberlite, which is studded with diamonds, garnets and other gems. The last known eruption of kimberlite to the surface of the earth happened 47 million years ago.

Diamonds have been extracted from almost every region of the world, from north of the Arctic Circle to the tropics of western Australia. Most diamond mines start with a wide pit; if the kimberlite pipe has a lot of diamonds, miners dig shafts 3,000 feet or more

Father-and-son team Robert and Bryant Linares (below: at the top-secret Apollo facility somewhere outside Boston) grow diamonds with a carbon gas cloud in a vacuum chamber (opposite) heated to more than 1,800 degrees Fahrenheit.

deep. In areas where rivers once ran over kimberlite seams, people sift diamonds from gravel. Loose diamonds used to turn up in fields in the Midwest in the 1800s; they were deposited there by glaciers. Most geologists believe that new diamonds continue to form in the earth's mantle—much too deep for miners to reach.

THE JEWELER STUDIES THE STONE AGAIN, PURSING HIS BROW. HE SIGHS. "THERE'S NO WAY TO TELL THAT IT'S LAB-CREATED."

The word "diamond" comes from the ancient Greek *adamas*, meaning invincible. People in India have mined diamond gems for well over 2,000 years, and first-century Romans used the stones to carve cameos. Over the ages, diamonds acquired a mystique as symbols of wealth and power. During the 16th century, the Koh-i-Noor, a 109-carat diamond from the Kollur mine in southern India, was perhaps the most prized item on the Indian subcontinent. Legend held that whoever owned it would rule the globe. "It is so precious," noted a writer at the time, "that a judge of diamonds valued it at half the daily expense of the whole world." Great Britain got the stone in 1849 when Lahore and Punjab became part of the British Empire; the diamond now sits in the Tower of London, the centerpiece of a crown made for Queen Elizabeth in 1937.

And yet diamonds are simply crystallized pure carbon, just as rock candy is crystallized sugar—an ordered array of atoms or molecules. Another form of pure carbon is graphite, but its atoms are held together in sheets rather than rigidly attached in a crystal, so the carbon sloughs off easily, say, at the tip of a pencil. Thanks to the strength of the bonds between its carbon atoms, diamond has exceptional physical properties. It's the hardest known material, of course, and it doesn't react chemically with other substances. Moreover, it's fully transparent to many wavelengths of light, is an excellent electrical insulator and semiconductor, and can be tweaked to hold an electrical charge.

It's because of these admittedly unglamorous properties that lab-produced diamonds have the potential to dramatically change technology, perhaps becoming as significant as steel or silicon in electronics and computing. The stones are already being used in loudspeakers (their stiffness makes for an excellent tweeter), cosmetic skin exfoliants (tiny diamond grains act as very sharp scalpels) and in high-end cutting tools for granite and marble (a diamond can cut any other substance). With a cheap, ready supply of diamonds, engineers hope to make everything from higher-powered lasers to more durable power grids. They foresee razor-thin computers, wristwatch-size cellphones and digital recording devices that would let you hold thousands of movies in the palm of your hand. "People associate the word diamond with something singular, a stone or a gem," says Jim Davidson, an electrical engineering professor at Vanderbilt University in Tennessee. "But the real utility is going to be the fact that you can deposit diamond as a layer, making possible mass production and having implications for every technology in electronics."

At the U.S. Naval Research Lab, a heavily guarded compound just south of the U.S. Capitol, James Butler leads the CVD program. He wears a gold pinky ring that sparkles with one white, one green and one red diamond gemstone, all of them either created or modified in a lab. "The technology is now at a point that we can grow a more perfect diamond than we can find in nature," he says.

ULRICH BOSER *is writing a book about the world's largest unsolved art heist. Photographer* **MAX AGUILERA-HELLWEG** *specializes in medical and scientific subjects.*

Butler, a chemist, pulls from his desk a metal box that brims with diamonds. Some are small, square and yellowish; others are round and transparent disks. He removes one wafer the size of a tea saucer. It's no thicker than a potato chip and sparkles under the fluorescent light. "That's solid diamond," he says. "You could use something like this as a window in a space shuttle."

THE LARGEST DIAMOND KNOWN IN THE UNIVERSE IS 2,500 MILES WIDE AND ONCE SERVED AS THE HEART OF A STAR.

The military is interested in lab-grown diamonds for a number of applications, only some of which Butler is willing to discuss, such as lasers and wearproof coatings. Because diamond itself doesn't react with other substances, scientists think it's ideal for a biological weapons detector, in which a tiny, electrically charged diamond plate would hold receptor molecules that recognize particular pathogens such as anthrax; when a pathogen binds to a receptor, a signal is triggered. Butler, working with University of Wisconsin chemist Robert Hamers, has produced a prototype of the sensor that can detect DNA or proteins.

THE LARGEST SINGLE-CRYSTAL DIAMOND ever grown in a lab is about .7 inches by .2 inches by .2 inches, or 15 carats. The stone isn't under military guard or at a hidden location. It's in a room crowded with gauges and microscopes, along with the odd bicycle and congo drum, on a leafy campus surrounded by Washington, D.C.'s Rock Creek Park. Russell Hemley, director of the Carnegie Institution's Geophysical Lab, started working on growing diamonds with CVD in 1995. He pulls a diamond out of his khakis. It would be hard to mistake this diamond for anything sold at Tiffany. The rectangular stone looks like a thick piece of tinted glass.

Hemley and other scientists are using laboratory and natural diamonds to understand what happens to materials under very high pressure—the type of pressure at the center of the earth. He conducts experiments by squeezing materials in a "diamond anvil cell," essentially a powerful vise with diamonds at both tips.

A few years ago, Hemley created one of the hardest known diamonds. He grew it in the lab and then placed it in a high-pressure, high-temperature furnace that changed the diamond's atomic structure. The stone was so hard that it broke Hemley's hardness gauge, which was itself made out of diamond. Using the super-hard diamond anvil, Hemley has increased the amount of pressure he can exert on materials in his experiments up to four million to five million times greater than atmospheric pressure at sea level.

"Under extreme conditions, the behavior of materials is very different," he explains. "Pressure makes all materials undergo transformations. It makes gases into superconductors, makes novel super-hard materials. You can change the nature of elements."

He discovered, for instance, that under pressure, hydrogen gas merges with iron crystals. Hemley believes that hydrogen might make up a portion of the earth's core, which is otherwise composed largely of iron and nickel. He has been studying the hydrogen-iron substance to understand the temperature and composition of the center of our planet.

In another surprising discovery, Hemley found that two common bacteria, including the intestinal microorganism E. coli, can survive under colossal pressure. He and his colleagues placed the organisms in water and then ratcheted up the diamond anvil. The water solution soon turned into a dense form of ice. Nevertheless, about 1 percent of the bacteria survived, with some bacteria even skittering around. Hemley says the research is more evidence that life as we know it may be capable of existing on other planets within our solar system, such as under the crust of one of Jupiter's moons. "Can there be life in deep oceans in outer satellites like Europa?" asks Hemley. "I don't know, but we might want to be looking."

Hemley hopes to soon surpass his own record for the largest lab-grown diamond crystal. It's not clear who has produced the largest multiple-crystal diamond, but a company called Element Six can make wafers up to eight inches wide. The largest mined diamond, called the Cullinan diamond, was more than 3,000 carats—about 1.3 pounds—before being cut. The largest diamond so far found in the universe is the size of a small planet and located 50 light-years away in the constellation Centaurus. Astronomers with the Harvard-

By pressing the points of two diamonds against each other (below left: diamonds grown at the Carnegie Institution), scientists can approximate and study pressures like those at the center of earth. (Below right: Russell Hemley examines a diamond anvil cell.)

A few diamond labs can grow a variety of shapes and sizes (stones and detritus from Apollo). For now, some "cultured" diamonds cost as much as mined gems.

Smithsonian Center for Astrophysics discovered the gigantic stone a few years ago, and they believe the 2,500-mile-wide diamond once served as the heart of a star. It's ten billion trillion trillion carats. The astronomers named it Lucy in honor of the Beatles' song "Lucy in the Sky With Diamonds."

NATURAL DIAMONDS AREN'T particularly rare. In 2006, more than 75,000 pounds were produced worldwide. A diamond is a precious commodity because everyone thinks it's a precious commodity, the geological equivalent of a bouquet of red roses, elegant and alluring, a symbol of romance, but ultimately pretty ordinary.

Credit for the modern cult of the diamond goes primarily to South Africa-based De Beers, the world's largest diamond producer. Before the 1940s, diamond rings were rarely given as engagement gifts. But De Beers' marketing campaigns established the idea that the gems are the supreme token of love and affection. Their "A Diamond Is Forever" slogan, first deployed in 1948, is considered one of the most successful advertising campaigns of all time. Through a near total control of supply, De Beers held almost complete power over the diamond market for decades, carefully hoarding the gemstones to keep prices—and profits—high. While the company has lost some of its power to competitors in Canada and Australia over the past few years, it still controls almost two-thirds of the world's rough diamonds.

Diamond growers are proud of the challenge they pose to De Beers and the rest of the natural diamond industry. Apollo's slogan is "A Diamond Is for Everyone." So far, though, Apollo's colorless gems cost about the same as natural stones, while the company's pink, blue, champagne, mocha and brown diamonds retail for about 15 percent less than natural stones with such colors, which are very rare and more expensive than white diamonds. Meanwhile, consumers may well be receptive to high-quality, laboratory-produced diamonds. Like most open-pit mines, diamond mines cause erosion, water pollution and habitat loss for wildlife. Even more troubling, African warlords have used diamond caches to buy arms and fund rebel movements, as dramatized in the 2006 movie *Blood Diamond*. Actor Terrence Howard wears a diamond lapel pin with Apollo stones. He told reporters, "Nobody was harmed in the process of making it."

Half a dozen other companies have begun to manufacture gem-quality diamonds using not CVD but a process that more closely mimics the way diamonds are created in the earth. The method—basically an improvement on how scientists have been making diamonds since the 1950s—requires heat of more than 2,000 degrees and pressure 50 times greater than that at the surface of the earth. (Both the heat and pressure are more than what CVD requires.) The washing machine-size devices can't produce stones much larger than six carats. These HPHT diamonds—the initials stand for high pressure and high temperature—have more nitrogen in them than CVD diamonds do; the nitrogen turns the diamonds amber-colored. For now, though, the process has a significant benefit over CVD: it's less expensive. While a natural, one-carat amber-colored diamond might retail for $20,000 or more, the Florida-based manufacturer Gemesis sells a one-carat stone for about $6,000. But no one, Gemesis included, wants to sell diamonds too cheaply lest the market for them collapse.

Gemologists plying everyday tools can seldom distinguish between natural and lab-grown diamonds. (Fake diamonds such as cubic zirconia are easy to spot.) De Beers sells two machines that detect either chemical or structural characteristics that sometimes vary be-

Diamond wafers (at the Naval Research Lab, James Butler holds an unpolished diamond disk and, opposite, his colleague Tatyana Feygelson examines a clear one) could serve as spacecraft windows or in bioweapons detectors.

Find out where to see famous diamonds at Smithsonian.com/diamonds

tween the two types of stones, but neither machine can tell the difference all the time. Another way to identify a lab-produced diamond is to cool the stone in liquid nitrogen and then fire a laser at it and examine how the light passes through the stone. But equipment is expensive and the process can take hours.

PEOPLE "WANT A UNIQUE DIAMOND, NOT A THREE-DAY-OLD FACTORY-MADE STONE," A DE BEERS SPOKESWOMAN SAYS.

Diamonds from Apollo and Gemesis, the two largest manufacturers, are marked with a laser-inscribed insignia visible with a jeweler's loupe. Last year, the Gemological Institute of America, an industry research group, began to grade lab-grown stones according to carat, cut, color and clarity—just as it does for natural stones—and it provides a certificate for each gem that identifies it as lab grown.

The diamond-mining companies have been fighting back, arguing that all that glitters is not diamond. De Beers' ads and its Web sites insist that diamonds should be natural, unprocessed and millions of years old. "Diamonds are rare and special things with an inherent value that does not exist in factory-made synthetics," says spokeswoman Lynette Gould. "When people want to celebrate a unique relationship they want a unique diamond, not a three-day-old factory-made stone." (De Beers does have an investment in Element Six, the company that makes thin industrial diamonds.)

The Jewelers Vigilance Committee (JVC), a trade group, has been lobbying the Federal Trade Commission to prevent diamond manufacturers from calling their stones "cultured," a term used for most of the pearls sold today. (People in the mined diamond business use less-flattering terms such as "synthetic.") The JVC filed a petition with the agency in 2006, claiming that consumers are often confused by the nomenclature surrounding lab-grown diamonds.

FROM THE BEGINNING of his research with CVD more than 20 years ago, Robert Linares hoped that diamonds would become the future of electronics. At the heart of almost every electrical device is a semiconductor, which transmits electricity only under certain conditions. For the past 50 years, the devices have been made almost exclusively from silicon, a metal-like substance extracted from sand. It has two significant drawbacks, however: it is fragile and overheats. By contrast, diamond is rugged, doesn't break down at high temperatures, and its electrons can be made to carry a current with minimal interference. At the moment, the biggest obstacle to diamond's overtaking silicon is money. Silicon is one of the most common materials on earth and the infrastructure for producing silicon chips is well established.

Apollo has used profits from its gemstones to underwrite its foray into the $250 billion semiconductor industry. The company has a partnership Bryant Linares declines to confirm to produce semiconductors specialized for purposes he declines to discuss. But he revealed to me that Apollo is beginning to sell one-inch diamond wafers. "We anticipate that these initial wafers will be used for research and development purposes in our clients' product development efforts," Linares says.

Before I leave the Apollo lab, Robert and Bryant Linares take me into a warehouse-like room about the size of a high-school gym. It's empty, except for large electrical cables snaking along the floor. The space will soon be filled with 30 diamond-making machines, the men say, nearly doubling Apollo's production capacity. It will be the world's first diamond factory, they say. "There was a copper age and a steel age," Bryant says. "Next will be diamond."

An avid collector, Sir John Soane (1753-1837) was one of Britain's most distinguished architects. He said that he designed his London home to emphasize the "fanciful effects which constitute the poetry of Architecture" and filled it with antiquities, fine art and exotic artifacts.

SMALL WONDERS

EUROPE'S IDIOSYNCRATIC HOUSE MUSEUMS YIELD PLEASURES BEYOND THEIR SIZE

BY TONY PERROTTET

WHAT IS IT ABOUT SMALL, QUIRKY MUSEUMS that makes them so compelling? Perhaps it's because they can be traced to antiquity, when Greco-Roman temples would display both wondrous artworks and pagan relics—the spear of Achilles, Helen of Troy's sandal, or "giants' bones" (usually petrified mammoth remains). Medieval cathedrals carried on the tradition: tortoise shells or "griffin's eggs" (actually those of ostriches) might be placed alongside the relics of saints. In the Renaissance, Italian princes began assembling cabinets of curiosities, eclectic displays that could include any creation of man or nature: Egyptian mummies, pearls, Classical sculptures, insects, giant seashells or "unicorn horns" (most often from narwhals). The Italian collecting mania spread, so that by the end of the 18th century, there were thousands of private galleries in affluent homes all over Europe. On their grand tours of the Continent, travelers could journey from one marvelous living room to the next, surveying beautiful and mystifying objects.

By the mid-1800s, state-funded institutions such as the Louvre, the British Museum and Madrid's Prado had begun to acquire these private collections, many of which had been inherited by family members who lacked either the finances or the enthusiasm to maintain them. Yet despite large museums' financial advantage, small, esoteric museums have held on tenaciously. In fact, Europe is still full of them, and they induce a devotion that their grander counterparts often do not.

Many of these small collections are still housed in their owners' original homes and reflect their personalities. A number of them boast collections that would

have pride of place in larger museums, but the domestic settings allow a sense of intimacy hard to find in vast galleries. And despite their idiosyncrasies, these house museums often provide a rare entree into a city's history and character. Here are four favorites:

LONDON
SIR JOHN SOANE'S MUSEUM

IT WAS A DAMP LONDON EVENING when I crossed the large, leafy square of Lincoln's Inn Fields toward a tasteful row of dun-colored Georgian town houses. On closer inspection, the facade of No. 13 announced this was no ordinary house: mortared into the Italian loggia, or veranda, of creamy Portland stone were four Gothic pedestals, while a pair of replicas of ancient Greek caryatids were mounted above. But these flourishes only hinted at the marvelous world that lies within the former home of Sir John Soane (1753-1837), one of Britain's most distinguished architects—and diligent collectors. Soane not only turned his house into a lavish private museum, he provided that nothing could be altered after his death. As a result, Sir John Soane's Museum may be the most eccentric destination in a city that brims with eccentric attractions. Visiting it, you feel that Soane himself might stride in at any moment to discuss the classics over a brandy. To preserve the intimacy of the experience, only 50 visitors are allowed inside at a time. And the evocation of a past time is even more intense if you visit—as I did—on the first Tuesday evening of the month, when the museum is lit almost entirely by candles.

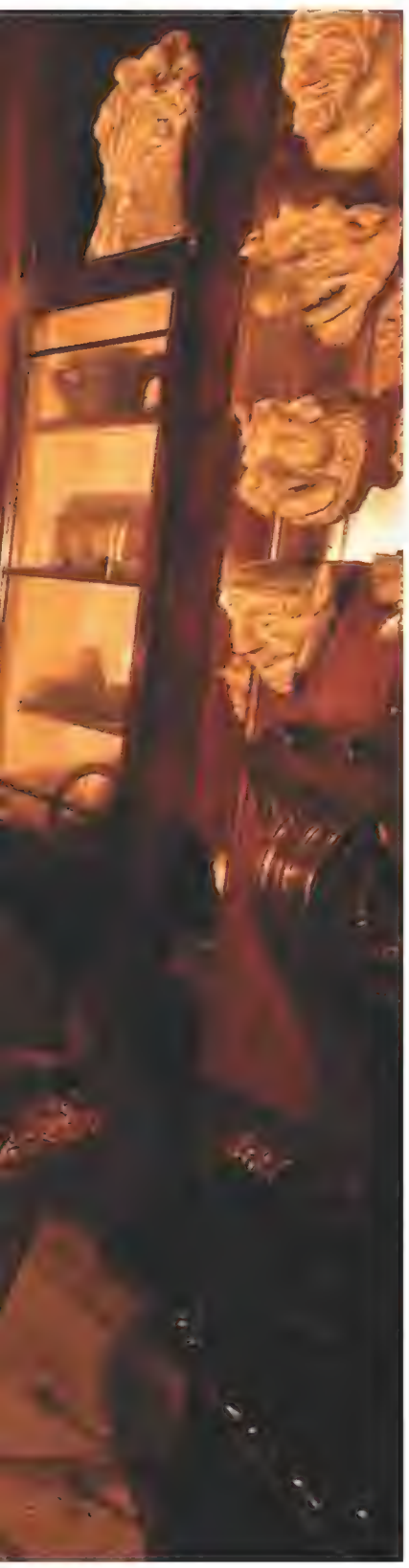
When I rang the bell, the imposing wooden door opened to reveal a gray-haired gentleman who might well have been Soane's butler. While I signed the guest ledger, an attendant fussed over my coat and umbrella, taking them for safekeeping. I was then ushered into a Pompeian red parlor.

PP. 62-63 NIGEL DICKINSON / DRR.NET; PP. 60-61 MASSIMO LISTRI / CORBIS

"I hope you enjoy the house," the attendant whispered.

On every table and mantel, candles blazed in glass cylinders. As I padded carefully down a passageway, my eyes adjusted to the light and I began to make out arrangements of artifacts and furniture that have barely changed in 170 years. The house is an intricately designed labyrinth, filled to capacity with art: Classical busts, fragments of columns and Greek friezes, Chinese vases, and statues of Greek and Roman gods, including a cast of the famed *Apollo Belvedere.* Scarcely an inch of wall space has been wasted, and yet the effect is not claustrophobic: arches and domes soar upward, convex mirrors provide expansive views and balconies yawn over interior courtyards. Like any decent cabinet of curiosities, the displays also include such oddities as a "large fungus from the rocks of the island of Sumatra" (as Soane described it in his own 1835 inventory) and a peculiar-looking branch of an ash tree. Adding to the sense of mystery, and in keeping with Soane's wishes, there are no labels on any of the artifacts, though some information is now provided on hand-held wooden "bats" that sit discreetly on tables in each room.

SIR JOHN SOANE'S MUSEUM, LONDON; SIR JOHN SOANE'S MUSEUM, LONDON / BRIDGEMAN ART LIBRARY



FIGURES EMERGED LIKE GHOSTS FROM THE "DEEP MASSES OF SHADOWS" AND THE CANDLES SHONE "LIKE LUSTROUS HALOS ROUND MARBLE HEADS."

Soane (top: c. age 75 in an 1829 portrait by Sir Thomas Lawrence) combined three town houses to create a unique home for his family and his eclectic collection. (Above: the alabaster sarcophagus of Pharaoh Seti I; left: Gothic sculptures adorn the Monk's Parlour.)

"People really respond to the candlelit evenings," says the museum's director, Tim Knox. In fact, warders, as the museum's guards are called, have begun turning off lights during the daylight hours, he tells me, "to enhance the period ambiance. The half-light makes people really look at the exhibits."

Soane was Britain's leading architect for nearly five decades, and his numerous commissions are all around London—the Dulwich Picture Gallery; the Royal Hospital, Chelsea; Pitzhanger Manor-House. (Even Britain's iconic red telephone booths were inspired by Soane's design for his wife's tomb in St. Pancras Gardens.) But it was in his own home—designed to emphasize what Soane called the "fanciful effects which constitute the poetry of Architecture"—that his creativity was given freest rein. From 1792 to 1824, Soane purchased, demolished and rebuilt three town houses along the square, starting with No. 12 and moving on to 13 and 14. Initially they were home to himself, his wife and their two sons, but starting in 1806, when he was appointed professor of architecture at the Royal Academy, he began to use them to display his architectural designs and models. In time, his growing collection of antiquities became more important, and with endless inventiveness, he redesigned his interiors to show off the artifacts to full effect.

Objects were placed so that every turn offers a discovery. One minute you are confronting a splendid Roman marble statue of Diana of Ephesus. The next, you are entering the Picture Room, lined with paintings such as Hogarth's *Rake's Progress*, a series of eight images charting the decline of a hedonistic young aristocrat. No sooner have you finished admiring an array of Piranesi drawings of Roman ruins than a warder opens a panel in the wall to reveal a group of paintings by Joseph Michael Gandy, Soane's draftsman. The gray-templed warder, Peter Collins, sports a carnation in his lapel and a red handkerchief in his top pocket. He has worked at the museum for ten years and knows his audience. He pauses for effect before opening yet another panel, this time revealing a balcony that looks out on the Medieval collection—called the Monk's Parlour—filled with Gothic fragments and grimacing gargoyles. In a nearby alcove, a bare-breasted bronze nymph poses coyly at eye level above a scale model of Soane's most impressive architectural achievement, the Bank of England. (The bank, which he worked on for 45 years, was demolished in the 1920s as outmoded—a move that many architectural historians regard as a travesty.)

The highlight of the collection is found in the basement, where funerary art clutters around the alabaster sarcophagus of Egyptian Pharaoh Seti I—Soane's pride and joy, purchased in 1824 for the sum of £2,000 (about $263,000 today) from

TONY PERROTTET'S *latest book,* Napoleon's Privates, *a collection of eccentric stories from history, is out this month from HarperCollins.*

the Italian adventurer Giovanni Belzoni. In 1825 Soane held a series of candlelit "sarcophagus parties" to celebrate its arrival. The social extravaganzas were attended by such luminaries as the Duke of Sussex, the Bishop of London, poet Samuel Coleridge and landscape painter J.M.W. Turner. Barbara Hofland, a guest, would write that at the event figures emerged like ghosts from the "deep masses of shadows" and candles shone "like lustrous halos round marble heads," creating an effect "as in a dream of the poet's elysium."

Among the many statues in the museum, it's easy to miss the 1829 bust of Soane himself on the first floor, placed above statuettes of Michelangelo and Raphael. The son of a bricklayer, Soane rose from humble origins; for his skill at sketching, he won a scholarship to tour Europe, which enabled him to visit Italy and develop a passion for Greco-Roman art. When he died at the ripe age of 83, Soane was one of the most distinguished individuals in Britain, a man, as Hofland wrote of the sarcophagus party guests, seemingly "exempt from the common evils of life, but awake to all its generous sensibilities."

This happy impression is reinforced by a Gandy drawing of the family in 1798: Soane and his wife, Elizabeth, are eating buttered rolls while their two young sons, John and George, scamper nearby. Of course, Soane was no more immune to fate's vagaries than the rest of us. His fondest ambition had been to found a "dynasty of architects" through his sons, but John was struck down in his 30s by consumption and George grew up to be quite the rake, running up huge debts and even publishing anonymous attacks on his father's architecture. Then too, Soane may not have been the easiest father. "He could be a man of great charm," says museum archivist Susan Palmer, "but he was also very driven, very touchy and moody, with a real chip on his shoulder about his poor origins."

Fearing that George would sell his collection when he died, Soane provided for its perpetuation in his will and was able to secure an act of Parliament in 1833 to ensure that his home would remain a venue, as he wrote, for "Amateurs and Students in Painting, Sculpture and Architecture." As a result, Soane's museum is run to this day by the Soane Foundation, although in the 1940s the British government took over the costs of maintenance in order to keep it free to the public, as it has been since Soane's death in 1837. "Thank goodness Mr. Soane didn't get on with young George," one of the warders observed with a laugh. "I'd be out of a job!"

I shuffled downstairs through the half-light, reclaimed my coat and umbrella and headed for the Ship Tavern, a 16th-century pub around the corner. As I dug into a shepherd's pie, I recalled the words of Benjamin Robert Haydon, another sarcophagus party guest: "It was the finest fun imaginable to see the people come into the Library after wandering about below, amidst tombs and capitals, and shafts, and noseless heads, with a sort of expression of delighted relief at finding themselves again among the living, and with coffee and cake."

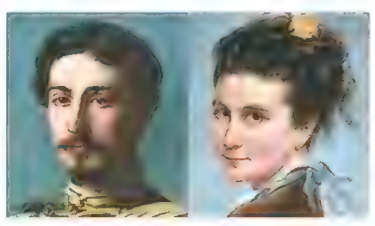
PARIS
MUSÉE JACQUEMART-ANDRÉ

THERE ARE DOZENS OF small museums scattered throughout Paris, and their most devoted patrons are Parisians themselves. Some have substantial collections, like the Musée Carnavalet, which specializes in the city's dramatic history and displays such items as a bust of Marat, a model of the Bastille and locks of Marie Antoinette's hair. Others are the former residences of hallowed French artists and writers—the studio of Delacroix, the apartment of Victor Hugo and the appealingly down-at-the-heels Maison Balzac, whose most illustrious exhibit is the author's monogrammed coffeepot.

But none inspire such loyalty as the Jacquemart-André.

If Sir John Soane's Museum distills the eccentric genius of London, the Musée Jacquemart-André is the height of *le bon goût*, good taste. More a mansion museum than a house

SHE WANTED THE FRENCH PUBLIC TO SEE, SHE SAID IN HER WILL, "WHERE A PAIR OF AMATEUR ART-LOVERS LIVED OUT A LIFE OF ENJOYMENT AND LUXURY."



Édouard André and his wife, Nélie Jacquemart, (above) filled their Paris home with a unique collection of decorative and fine arts, including such masterpieces as Botticelli's *Virgin and Child* (top). The couple's "Italian Museum" (right) featured sculpture and Florentine and Venetian art.

R. RECOURA; SCALA / ART RESOURCE, NY; CULTURESPACES

museum, it was nonetheless home to connoisseurs Édouard André and his wife, Nélie Jacquemart, a fabulously wealthy couple who in the 1880s and '90s built their own self-contained world of art and beauty on the Boulevard Haussmann—a fashionable avenue on the Right Bank, not far from the Champs-Élysées—replete with masterpieces that Louvre curators undoubtedly covet to this day.

At first glance, the museum could not be more different from Soane's. Bursting with color, it exudes a luxuriant sense of space. But no less than Soane's, it sweeps visitors back to another era—in this case, the Paris of La Belle Époque, when the city blossomed as Europe's capital of elegance, and to the even earlier golden age of Louis XV and Louis XVI.

No sooner does one step from the old carriage driveway into a formal courtyard than the sound of Parisian traffic fades away. Ascending wide stone steps graced by sculpted lions, one feels a flush of privilege, like a guest who has been invited to a private soirée. Inside, one is met by a three-quarter-length portrait of the master himself, Édouard André—a dashing figure in the uniform of the Imperial Guard under Emperor Napoleon III, complete with gold brocade and scarlet breeches. A manicured *gardienne* ushers guests into the Picture Gallery, where the seduction continues. André had a passion for 18th-century French art, fueled by his nostalgia for pre-Revolutionary days, and the first floor is devoted to it. On gilt-framed canvases, voluptuous goddesses float naked on clouds and rosy-cheeked children pose with birds and kittens. A visitor drifts from the gilded Grand Salon to the soaring Music Room, where formally attired guests once gathered for concerts, then on to the glass-roofed Winter Garden, filled with exotic plants and gleaming marble, where an extravagant double stair-

PP. 64-65 FORESTIER YVES / CORBIS SYGMA

case spirals up to the second floor.

And so the house unfolds, offering one dazzling gallery after another. The Library, where Édouard and Nélie pored over art catalogs and plotted their purchases, is home to their world-class array of Dutch paintings, including three Rembrandts and three Van Dycks. Japanese ceramics and Persian antiquities enliven the Smoking Room, where Édouard would retire after dinner with his male companions to smoke cigars and discuss the issues of the day, while the Tapestry Room, used for business meetings, is lined with scenes of Russian peasant life created by the Beauvais Tapestry factory in 1767. As one climbs to the second floor, a playful Tiepolo fresco on the staircase wall depicts the arrival of Henry III in Venice. The upper level is devoted to the couple's "Italian Museum"—one room for Renaissance sculpture, a second for Florentine art, including two paintings by Botticelli, and a third room for André's beloved collection of the art of Venice.

The mansion, which was designed for André by architect Henri Parent, was completed in 1875, when the Boulevard Haussmann was one of Paris' chic new addresses and André was one of the city's most eligible bachelors. Heir to an enormous banking fortune, he had grown disillusioned with public life and decided to devote himself to collecting art and publishing a fine arts journal. In 1881, when he was nearly 50, he married Nélie Jacquemart, the woman who had painted his portrait nine years earlier. In many ways, she was an unlikely match for this aristocratic boulevardier. Nearly 40 herself, Jacquemart was no high-society belle. She was an independent woman from a humble background—evidently illegitimate—who had supported herself as a portrait artist, quite an unusual achievement for a woman at the time.

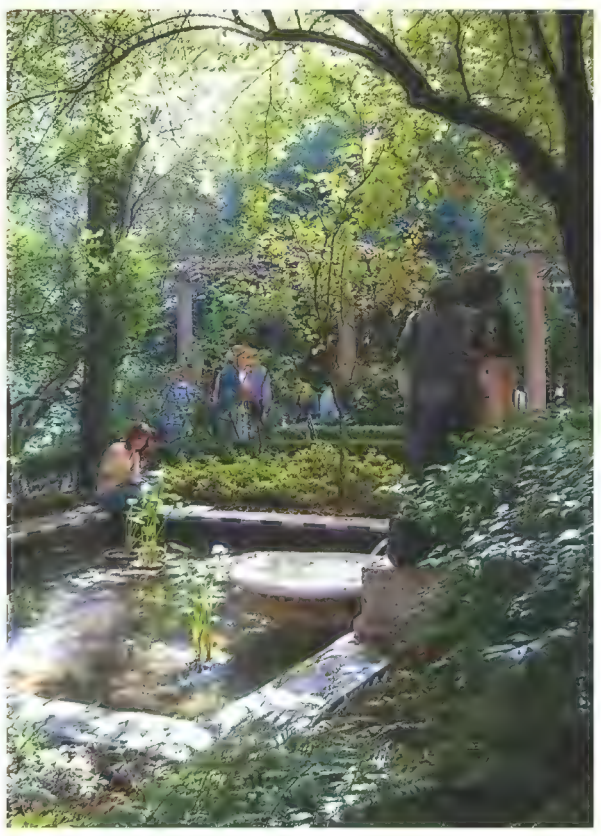
It was a marriage based on shared taste. During their 13 years together, the couple traveled for part of each year, most often to Italy, where they attended auctions with the help of experts from the Louvre, who were motivated to win art for France. After Édouard died in 1894, at age 61, Nélie continued traveling the world, going as far as Burma for her purchases. On her death at 71 in 1912, she donated the house to the Institut de France (an academic organization that manages foundations and museums) on the condition that the collection remain intact, so that the French public could see, she said in her will, "where a pair of amateur art-lovers lived out a life of enjoyment and luxury."

Indeed, there is enormous pleasure to be taken from seeing the couple's paintings and sculptures mixed in with their objets d'art and fine furniture in a domestic setting. After a while, however, even the finest taste can be a little overbearing. Visitors can't help but speak in hushed tones so as not to upset the exquisite equilibrium.

But the mansion bursts to exuberant life in the Dining Room—the former heart of the original mansion—which has been converted into one of Paris' most sumptuous café-restaurants. In this airy chamber, where the couple entertained friends beneath lavish tapestries, one can now enjoy a salade niçoise and glass of sauvignon blanc. There

PP. 66-67 TONY PERROTTET

WITH ITS TRANQUIL POOLS AND THE EVER-PRESENT SOUND OF FLOWING WATER, THE GARDEN WAS THE PLACE WHERE SOROLLA MOST LOVED TO PAINT.



Joaquín Sorolla y Bastida (top: in a 1909 self-portrait) was one of Spain's most beloved painters. From 1911 to 1923 he worked and lived in the Madrid house (left: the living room; above: one of the gardens, designed by Sorolla) that is today the Museo Sorolla.

CASA SOROLLA; TONY PERROTTET

is a strange feeling of being watched here, and not just by fellow diners: the ceiling is a marvelous joke, another Tiepolo fresco—this one depicting a crowd of Venetian nobles leaning over a balustrade, pointing and smiling at the diners below.

Perched on the mantelpiece is a bust of Nélie Jacquemart. She many not have fit in with the city's fashionable set—later in life, she retired to her rural chateau, Chaalis, today another grand house museum, 30 miles outside the city—but she certainly took a fierce pride in her collection, and one imagines her still basking in the pleasure it creates.

MADRID
MUSEO SOROLLA

MADRID IS A CITY OF EXTRAVAGANT FACADES whose true attractions lie behind closed doors. Hidden beyond a stone wall in the former working-class district of Chamberí, a ten-minute taxi ride from the bustle of the Plaza Mayor in downtown Madrid, lies the sun-filled Museo Sorolla. The former home and art studio of one of Spain's most beloved painters, Joaquín Sorolla y Bastida, it is a succulent garden of tinkling fountains and exuberant flowers, an explosion of Mediterranean color and *joie de vivre*.

From 1911 to 1923, this Andalusian-style house was the residence of one of the world's best-known artists. Born to a humble family in Valencia in 1863, Sorolla kept his distance from Europe's avant-garde movements but won international fame for his subtle technique, evoking the play of sunshine in his scenes of Mediterranean beaches and images of Spanish daily life.

Stepping into the seductive confines of the compound, where Sorolla lived with his wife and three children, is like entering one of the artist's luminous paintings. With its Moorish flourishes, tranquil pools and ever-present sound of flowing water, the garden was the place where he most loved to paint. When I visited, Sorolla's private Arcadia was filled with earnest art students experimenting with watercolors in shady corners. Tiled steps lead up to the house, whose first rooms display his works, just as they did 80 years ago for potential buyers. The home's living spaces contain the family's original Art Nouveau furniture and Tiffany lamps. But the emotional core of the house is Sorolla's studio, a large vaulted room painted a rosy red and suffused with sunshine. Sorolla's easels stand ready, as if he had just left for a siesta; his palettes, brushes and half-used paint tubes are close by. A small Turkish bed occupies one corner of the room and a book of 16th-century songs sits open on a stand. A drawing Sorolla made of Velázquez's famous portrait of Pope Innocent X presides over all.

Sorolla moved into the house, which he had built, in 1911, at the high point of his career. By then he had exhibited his work from London to St. Louis, Missouri, had been showered with international awards, befriended intellectuals and artists, including John Singer Sargent, painted the portrait of Spanish King Alfonso XIII and U.S. President William Howard Taft and, under the patronage of railroad-fortune heir Archer Huntington, had been commissioned to paint a vast mural in the Hispanic Society of America in New York City.

After his death at 60 in 1923, Sorolla's international reputation suffered, overshadowed by the work of Post-Impressionists such as Cézanne and Gauguin. As with his friend Sargent, many critics decided that Sorolla was too conservative and commercial. But in Madrid, Sorolla's artistic standing has never been shaken, and since its opening by his widow and son in 1931, the Museo Sorolla, which also houses the most extensive collection of his works in the world, has enjoyed a steady stream of pilgrims. Today, their faith is being

vindicated; Sorolla is being reevaluated by critics, who are placing him as a bridge between Spanish old masters such as Velázquez and Goya and the Post-Impressionists. In 2006, Madrid's prestigious Thyssen-Bornemisza Museum hosted "Sargent/Sorolla," an exhibition tracking the parallel careers of the pair.

At the Museo Sorolla, as in all house museums, a chord of melancholy intrudes: the artist, we learn, was painting a portrait in his beloved garden in 1920 when, at the age of 57, he suffered a stroke. Although he lived for another three years, he produced little new work. But such gloomy meditations do not suit the house, or the sensual spirit of modern Madrid. The best solution—as Sorolla himself would likely have agreed—is to head to a nearby café to sip a glass of *vino blanco* and bask in the Spanish sun.

Built in 1911-12, Prague's Black Madonna House is now the Museum of Czech Cubism. The staircase and its balustrade of skewed geometric forms (right) spiral up to three floors of Cubist exhibits (above: ceramic boxes designed by Pavel Janak in 1911).

PRAGUE
THE BLACK MADONNA HOUSE: THE MUSEUM OF CZECH CUBISM

UNSCATHED BY TWO WORLD WARS, the heart of Prague feels like a fantasy of Old Europe. Gothic spires frame Art Nouveau cafés, and on the Medieval Astronomical Clock, next door to Franz Kafka's childhood home in the Old Town Square, a statue of Death still pulls the bell cord to strike the hour. But if you turn down a Baroque street called Celetna, you confront a very different aspect of the city—the stark and surprising Black Madonna House, one of the world's first Cubist buildings and home today to the Museum of Czech Cubism. Designed by Prague architect Josef Gocar, the House was shockingly modern, even revolutionary, when it opened as a department store in 1912—and it still seems so today. The overall shape is appropriately boxlike and predictably austere, but on closer inspection the facade is broken up by the inventive use of angles and planes. Large bay windows protrude like quartz crystals, and angular ornamentation casts subtle shadows. The interior is no less unusual, with the city's first use of reinforced concrete allowing for the construction of generous open spaces. The House's peculiar name comes from the 17th-century statue of the Black Madonna and Child rescued from a previous structure on the site and now perched like a figurehead on one corner of the building.

But not even the Madonna could protect the House from the vagaries of Czech history. Following World War II and the Communists' rise to power, the department store was gradually gutted and divided into office space. After the 1989 Velvet Revolution ended Communist rule, the building had a brief life as a cultural center, but it was only in 2003 that it found its logical role in the fabric of Prague—as a shrine to the glories of Czech Cubism.

Most of us think of Cubism as an esoteric avant-garde movement advanced by Parisian artists Pablo Picasso, Georges Braque and others in the years before World War I. But the movement swept across Europe and was embraced in Russian and Eastern European capitals as well—nowhere more avidly than in Prague, where Cubism was seized upon, if only for an incandescent moment, as a possible key to the future.

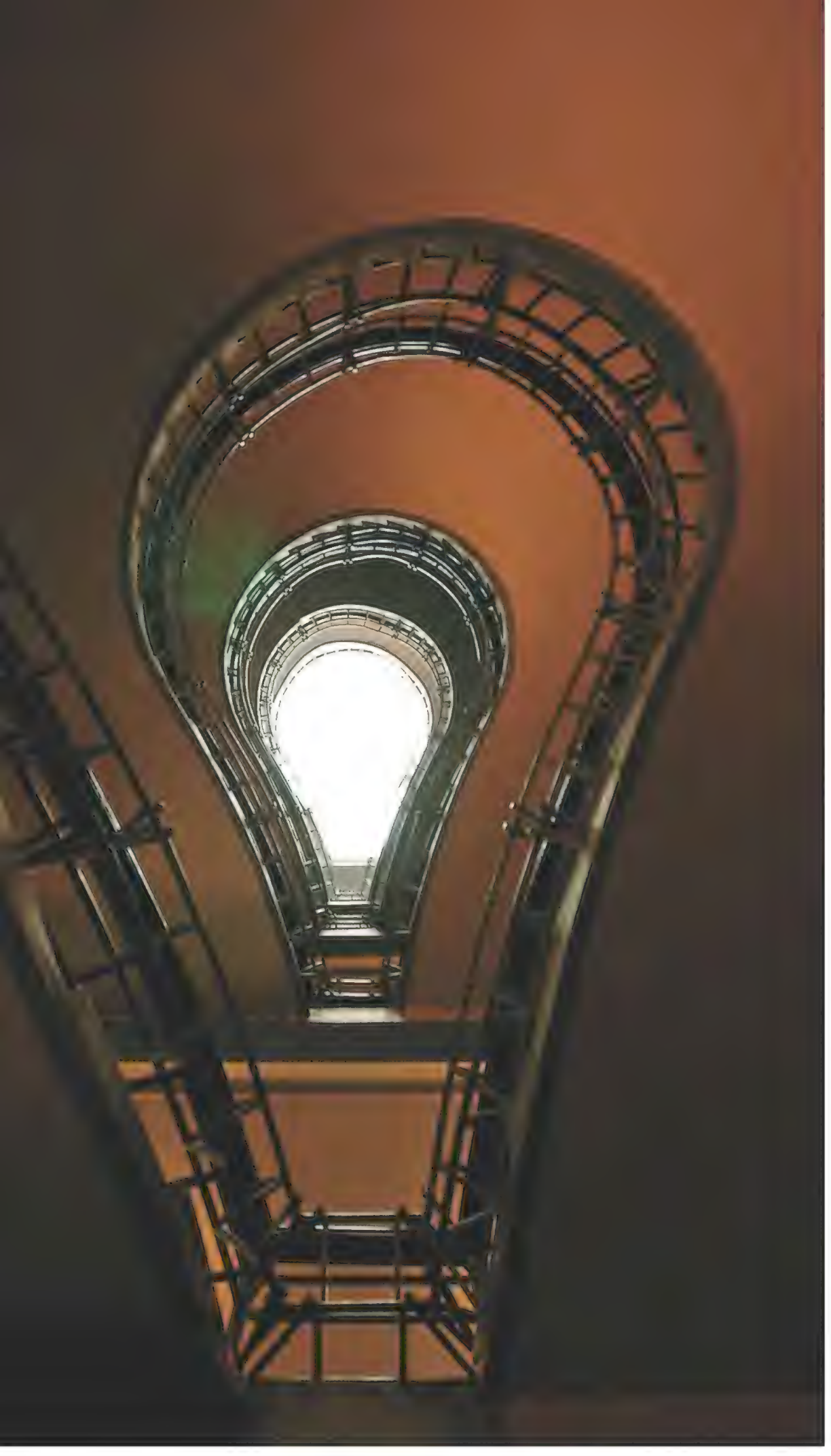
"SO CUBISM IN PRAGUE WAS A GRAND EXPERIMENT, A SEARCH FOR AN ALL-ENCOMPASSING MODERN STYLE THAT COULD BE DISTINCTIVELY CZECH."

"In Paris, Cubism only affected painting and sculpture," says Tomas Vlcek, director of the Collection of Modern and Contemporary Art at the country's National Gallery, which oversees the Museum of Czech Cubism. "Only in Prague was Cubism adapted to all the other branches of the visual arts—furniture, ceramics, architecture, graphic design, photography. So Cubism in Prague was a grand experiment, a search for an all-encompassing modern style that could be distinctively Czech."

The coterie of Czech Cubists—principally Gocar, Otto Gutfreund and Bohumil Kubista—first came together in 1911, founding a magazine called *Artistic Monthly* and organizing their own exhibitions in the years before World War I. It was a time of intense optimism and energy in Prague. This small Eastern European metropolis, one of the wealthiest in the Austro-Hungarian Empire, drew on its vibrant

CESKÉ RADIOKOMUNIKACE / MUSEUM OF DECORATIVE ARTS IN PRAGUE

For details on these and other small museums, visit Smithsonian.com/smallmuseums



PP. 68-69 EDDIE GERALD / ALAMY

Czech, German and Jewish traditions for a creative explosion. Expatriate artists were returning from Paris and Vienna to share radical new ideas in the salons; Kafka was scribbling his first nightmarish stories; Albert Einstein was lecturing in the city as a professor. "It was something like paradise," says Vlcek, looking wistful.

Today, the Museum of Czech Cubism is a shrine to the movement's heyday (1910-19), with the building itself as the prime exhibit. The entryway is an angular study in wrought iron. Inside, one immediately ascends a staircase of Cubist design. Unlike the stairs in Marcel Duchamp's *Nude Descending a Staircase,* the steps are thankfully even, but the metal balustrade is a complex interplay of geometric forms. There are three floors of Cubist exhibits, filled with art forms unique to Prague. Elegant sofas, dressing tables and lounge chairs all share dramatically oblique lines. There are abstract sculptures and paintings, bold, zigzagging graphics, and cockeyed vases, mirrors and fruit cups.

While this may not be strictly a house museum, it does have a domestic feel. The many black-and-white portraits of obscure artists in bowler hats and bow ties reveal a thriving, bohemian cast of characters: one sofa, we learn, was "designed for the actor Otto Boleska," another for "Professor Fr. Zaviska." What sounds like a Woody Allen parody of cultural self-absorption captures the idiosyncratic nature of Prague itself, a city that takes pride in its most arcane history. And like all small museums in touch with their origins, unique features have brought ghosts very much back to life. Visitors can now retire to the building's original Cubist eatery, the Grand Café Orient, designed by Gocar in 1912. This once-popular artists' hangout was closed in the 1920s and gutted during the Communist era, but meticulous researchers used the few surviving plans and photographs to recreate it. Now, after an eight-decade hiatus, a new generation of bohemians can settle in beneath Cubist chandeliers in Cubist chairs (not as uncomfortable as they sound) to argue politics over a pint of unpasteurized Pilsener. Finally, on the ground floor, the museum store has recreated a range of Cubist coffee cups, vases and tea sets from the original designs of architect and artist Pavel Janak, and offers reproductions of Cubist furniture by Gocar and others.

After an afternoon immersed in all those angles, I began to notice subtle Cubist traces in the architectural cornucopia of Prague's streets—in the doorway of a former labor union headquarters, for example, and on an elegant arch framing a Baroque sculpture next to a church. Inspired, I decided to track down a Cubist lamppost I had heard about, designed in 1913 by one Emil Kralicek. It took a little wrestling with Czech street names, but I finally found it in a back alley in the New Town: it looked like a stack of crystals placed on end.

I could imagine Sir John Soane—transported to modern Prague—pausing before it in unabashed admiration.

GREGORY CREWDSON'S

THE PHOTOGRAPHER USES MOVIE PRODUCTION TECHNIQUES TO CREATE "IN-BETWEEN MOMENTS." BUT YOU'LL HAVE TO SUPPLY THE STORY LINE

THE PHOTOGRAPH seems utterly serendipitous: a boy stands under a bridge, framed by lush trees, and directs his (and the viewer's) gaze heavenward through backlit fog toward some unseen attraction.

But nothing has been left to chance. The photographer, Gregory Crewdson, scouted the spot under a Massachusetts railroad bridge for a month, and a crew of about 40 people spent days setting up the shot. The illumination comes from lights suspended from cranes, and the fog rises from hidden machines. Crewdson instructed the boy, who had been hanging around the bridge, to imagine "a dream world

"I always see them as a world unto themselves," says Crewdson (left) of his photographs. "They exist in their own parameters."

EPIC EFFECTS

BY KENNETH R. FLETCHER

where everything is perfect."

Such preparation for a single photographic image may seem a bit much, but this was a relatively simple Crewdson shoot. For some of the photographs collected in his new book, *Beneath the Roses*, he shut down public streets, used rainmaking machines to produce downpours—even simulated a raging house fire. He uses such Hollywood-scale production techniques to create what he calls "in-between moments"—interludes just before or after unspecified but obviously momentous events. His pictures set the stage for a story, but the viewer has to flesh it out.

"When I'm making my pictures, I never really think about what happens before or what happens after," says Crewdson, 45. Growing up in Brooklyn in the 1960s, he was intrigued by his father's work as a psychoanalyst. "The fact that his office was in our house always suggested some sense of the furtive or the secret," he says. Dyslexia eventually drew Crewdson to photography. "I have a very difficult time thinking linearly," he says. "I tend to think more in terms of images."

While at the Yale University School of Art, where he earned an MFA in 1988, Crewdson spent lots of time taking pictures in western Massachusetts, where his family had a cabin. Since then, he has used that landscape as a giant photo studio, seeking locations that he says evoke the "familiar and unfamiliar."

The resulting pictures, typically

BELOW: DAN KARP; PP. 72-73 GREGORY CREWDSON; P. 70 & PP. 70-71 GREGORY CREWDSON

For indoor scenes, Crewdson's crew builds sets on a soundstage (left). His plans are meticulous, but he also improvises: this scene was originally "just going to be the woman sitting there alone," he says. "I wound up putting the kid in. . . . He's staring blankly at the blood on the roast beef. To me it's like a coming-of-age picture."

To see more of Crewdson's pictures, visit Smithsonian.com/crewdson

When Crewdson asked authorities in Pittsfield, Massachusetts, if they had a derelict house he could use for this scene, he says he "saw a twinkle in the eye of the fire department chief." To create the illusion of a house fire, a special-effects expert used propane-fueled "flame bars" set near fireproofed window locations.

stitched together from negatives scanned into a computer, "look like paintings, but they give you an emotional feeling stronger than a lot of movies you'd walk away from," says Rick Sands, Crewdson's director of photography, who has also worked on films. "If you read a screenplay, it is telling you where to go. . . . You take yourself places in one of his pictures."

The photographs in the book were taken over seven years at a cost of "less than you think it would," says Crewdson. He and his wife, Ivy, an art consultant, live in Greenwich Village with their children, Lily, 3, and Walker, 1. He often gets his ideas while swimming (he tries to get in some laps every day), but it takes months to produce a finished image. For outdoor scenes, he'll drive around to find sites; interiors are built on a soundstage at the Massachusetts Museum of Contemporary Art in North Adams. Crew members say he knows what he wants but is open to possibilities. "He'll tell me he wants women that look haunted or somebody who looks like they've lived a hard life," says casting director Juliane Hiam.

Crewdson teaches photography at Yale, but making pictures is his "main job"; a Crewdson print can sell for up to $150,000. He insists it's not about money. "It's just about trying to find something elusive and beautiful and mysterious in the world," he says.

KENNETH R. FLETCHER *is an intern at* SMITHSONIAN *magazine.*

ABOVE: LAURA BERNING; PP. 74-75 GREGORY CREWDSON

He was a golfing wonder, a dapper strongman and the toast of the Hollywood smart set—then his past caught up with him

BY LEIGH MONTVILLE

THE Montague Magnificent

THE MAN WHO CALLED HIMSELF JOHN MONTAGUE seemed to appear out of nowhere, simply popping up at the first tee of the public golf courses around Hollywood, California, in the early 1930s. He was a squat and powerful character, somewhere in his late 20s, and he came armed with a pleasant disposition, good looks and a curious set of oversize clubs that featured a driver that weighed nearly twice as much as normal, a monster of a club with a huge head that sent golf balls well over 300 yards down the fairways.

ILLUSTRATION: BEN PERINI; BETTMANN / CORBIS; P. 77 BETTMANN / CORBIS

SPADE WORK
On the golf course, Montague would bet on anything, even if it involved equipment not usually found in a golf bag (opposite).

Or at least it did for him. He knew how to make that driver work.

"My brother Bob first met Montague when he was playing out at Sunset Fields," Bud McCray, a local golfer of note, once said, describing his first sighting of the new arrival. "There is a dogleg where the city of Beverly Hills turns into the city of Los Angeles on Wilshire Boulevard, and at two in the morning, Montague used to stand there and hit golf balls down Wilshire Boulevard."

There was a touch of unreality, a mystery about him from the start. He wasn't one of those casualties from the first stages of what would become the Great Depression, wandering into town battered and bankrupt, following a last-chance dream of palm trees and prosperity. He wasn't part of the perpetual stream of tap-dancers and cowboys and lounge singers hoping to find celluloid stardom on the back lots of the movie studios. He was a golfer. He wanted to play golf.

Where did he come from?

He never said.

What did he do for a living?

He never said.

He just wanted to play golf.

Far from indigent, he dressed well, drove fast cars and within a few months was breaking course records. No one ever had seen a man attack this game, this sport, quite the way he did. His long drives set up easy approach shots, which set up birdie putts, which he made more often than he missed. He could sculpt shots around trees or over buildings, step on a ball in the sand, bury it, then blast it out to the desired location. He was a golfing wonder.

Rumors soon circulated about how he had pointed at a string of birds on a telephone wire 175 yards away from a tee at Fox Hills Country Club, picked out a bird in the line, unleashed his three wood and smacked a shot that not only hit the bird, but struck it dead, broke its neck. Broke its *neck*! He supposedly would open a window in the clubhouse, any clubhouse, prop it open with a water glass, then knock a succes-

A RAKE ABOUT TOWN

In Hollywood, Montague hung out with the stars (top right: Oliver Hardy) and became legendary for winning a golfing bet (top left: re-enacted) with Bing Crosby (middle right). After his forced departure for New York, he met Joe DiMaggio (above, with George Raft, center, seeking his autograph) and hit the links with Babe Ruth.

BETTMANN / CORBIS; COURTESY OF IRA R. ABRAMS; BILL WALLACE / NEW YORK DAILY NEWS ARCHIVE; BETTMANN / CORBIS (2)

sion of chips through the small space, never breaking the window nor whacking the wall. He supposedly hit a box of matches off a cocker spaniel's head. The dog never blinked.

The stories and the record scores accumulated in a fast pile. Not only did this John Montague play great and goofy golf, he seemed able to outdrink, out-eat, out-arm wrestle the world. His appetites and abilities seemed almost superhuman. He routinely showed off his strength. Need to change a tire? No jack was necessary. Montague could simply hold the proper end of the car aloft while someone else attached the spare.

In a town of interesting characters, he moved rapidly toward the top of the list. He became someone to know.

"I think I met him the first time in Palm Springs," actor Richard Arlen said. "We played at the only course there was at the time [O'Donnell Golf Club]. Par was either 68 or 70. The latter, I think. O'Donnell was a nine-hole course that put a premium on accuracy. This was one of Monty's strong points. His rounds were 61-61-61-59!"

Arlen, a leading man, star of *Wings*, which won the first Academy Award for best picture in 1928, became an early friend. The actor was an avid golfer with a low handicap, fascinated by Montague. He played often with him, took him to different courses around the area, eventually suggested that Montague join him as a member of his home course in Burbank. Montague agreed.

The course was the Lakeside Golf Club.

LAKESIDE GOLF CLUB seemed to have been created by a popcorn-filled imagination. Within hailing distance of no fewer than three movie studios—so close to Universal that it bordered the company zoo, golfers able to hear the lions, tigers and elephants kept on the premises for jungle movies—the club was filled with celebrated faces. Oliver Hardy, Johnny Weissmuller and Douglas Fairbanks were members. Howard Hughes was a member. Charles Coburn. Adolph Menjou. Humphrey Bogart. Randolph Scott. Don Ameche. Guy Kibbee.

W. C. Fields was a member, lived on the other side of Toluca Lake, and sometimes would row across, flask of gin in his pocket, to make his starting time. Bing Crosby was a member. Mack Sennett was, too. Lakeside was a movieland refuge, a playground, a reward for wealth and fame.

John Montague inserted himself nicely into the picture in 1933. In no time at all, he became the club champion. He hit shots that no one ever had seen, drove greens that seldom, if ever, had been driven. He would bet on anything, bet that he could drive a golf ball three-quarters of a mile in five shots, bet he could chip onto the practice green through the clubhouse window, bet he could stack and bury three balls in a sand trap and hit only the middle one out of the trouble.

His feats of strength were just as remarkable. He would walk into the bar, spot Oliver Hardy, grab the 300-pound comedian by the shirt with one hand and *lift him onto the bar.* ("What'll you have, Babe?") In the clubhouse, he wrestled George Bancroft, a character actor of some renown, a big guy who specialized in playing villains. *He stuffed George Bancroft into a locker.* He pulled a drowning woman from Henshaw Dam Lake near San Diego. There seemed to be no stopping him.

THE STORIES AND THE SCORES ACCUMULATED IN A FAST PILE. IN A TOWN OF INTERESTING CHARACTERS, HE MOVED RAPIDLY UP TO THE TOP OF THE LIST.

"We were out one night and somehow or another there was an altercation with the driver of another car," Johnny Weissmuller reported. "Seems like he thought Monty should have stopped and let him ahead of us. The guy started cussing and generally harassing us and walked up to the car and kept it up. Monty didn't say anything, he just got out of the car, walked up to the front of the guy's Lincoln, picked it up yea high and let it drop. One of the lights fell off and Monty just walked back to the guy and said, 'What did you say?' The smart guy almost fainted as we drove off."

Weissmuller was a former Olympic swimming champion, the reigning Tarzan in the movies. Even Tarzan of the Jungle was impressed.

The most storied incident on the Lakeside golf course was the one-hole match Montague staged with Bing Crosby. Already the country's most famous singer, not to mention a top movie star, Crosby was a constant and good golfer. He lived on Toluca Lake, sometimes played 36 holes in a day. Always looking for a match, one more round before sunset, he played against the Lakeside caddies, played against the members, played against Montague.

At the end of one encounter, sharing drinks in the bar, Montague the winner again, Crosby bemoaned his luck. A bad bounce here, a bad lie there had ruined his game. Montague disagreed. He said a turn of luck would not have changed the result of the match. To prove it, he bet he could beat Crosby without even using golf clubs. He said he could beat him with a baseball bat, a shovel and a rake. Crosby jumped at the offer.

Montague went to his car—and maybe Crosby should have suspected something if his opponent just happened to have a baseball bat, shovel and rake in the car—and returned with the implements. He then proceeded to hit a golf ball 350 yards into a sand trap with the baseball bat, shovel the ball to within eight feet of the hole, then get down on all fours and

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ILLUSTRATION: BEN PERINI

make the putt for a birdie using the rake handle like a pool cue. This beat Crosby's par 4, which was executed with a normal drive, chip and two putts, all with standard clubs.

"That was enough for me," the singer said. "I went back to the clubhouse for a little more conviviality."

The Crosby story was wildfire. The tale was told and retold around Hollywood, exaggerated often, the match stretched to 18 holes in some accounts, the shots made longer and more difficult. The amount of the bet—the two participants always claimed it was five bucks—turned into thousands. Montague was now forever "the man who beat Bing Crosby using a baseball bat, a shovel and a rake."

TRUE BELIEVER
Grantland Rice was skeptical. Then he saw Montague play.

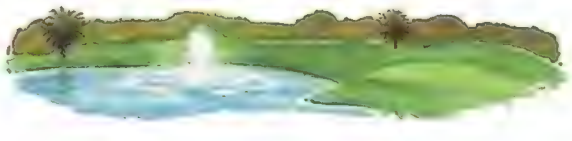
The stories grew. Birds of all descriptions were now felled from telephone wires at all distances. Weissmuller said he had seen Montague kill a *sparrow*. George Bancroft was not only stuffed into a locker, but the door was shut and Bancroft had to beg to be released. Montague, it was said, could light a wooden match with a golf club, the match placed in the teeth of a caddie lying on a tee. Montague could hit carom shots off oak trees, the ball landing on the green. Montague could do anything. George Von Elm, the 1926 U.S. Amateur champion, called him "the greatest golfer I ever saw."

The strange part of all this was that the man in question did little to encourage it. He was shy, almost secretive. In a town where fame was a career goal, he wanted no part of it.

He refused to enter any tournaments other than club championships. He rejected all offers to turn pro, to take on the famous names like Bobby Jones or Walter Hagen. He didn't play for championships, only for "other reasons"—for fun.

Even with the closest of his new friends—and he lived in Oliver Hardy's house for a while—he shared little of his own story. No one knew where he was from, what forces had driven him to Hollywood. No one knew where he made his money or how he supported himself. (It's still unknown.) He was a mystery and apparently wanted to stay that way. If someone took his picture, he would ask for the film. He would pay for the film, then destroy it.

JOHN MONTAGUE WAS THE GREATEST GOLFER IN THE WORLD! RICE SAT ON HIS OPINION FOR AS LONG AS HE COULD. THEN HE STARTED WRITING.



The role of local legend suited him fine. He could have—and would have—lived this way forever. No pictures. No publicity. Except this was Hollywood. Except this was the Lakeside Golf Club.

Grantland Rice was a member of the Lakeside Golf Club.

RICE WAS NOT JUST the most famous sportswriter in the country, he was a one-man sports conglomerate. By one estimate, he probably had made more money in the Roaring Twenties than any sports figure except Jack Dempsey. His column was printed in more than 100 newspapers, read by more than ten million people. He wrote books, feature articles, scripts for movie shorts, had his own radio show, edited a magazine called *American Golfer*.

He was based in New York, now at the *Sun* newspaper, but he spent two months of every year in Los Angeles. The slow time in sports ran from the end of the football season until the start of baseball's spring training, so every December Rice and his wife would head west. They would visit their only daughter, Floncy, an actress who lived in Hollywood, and Rice would cover the Rose Bowl.

He would also play some golf in the winter sun. He loved golf.

"Golf is 20 percent mechanics and technique," he once wrote. "The other 80 percent is philosophy, humor, tragedy, romance, melodrama, companionship, camaraderie, cussedness and conversation."

A scratch golfer at one time, he had played in foursomes with most of the greats. He was a friend and great admirer of Bobby Jones, the winner of golf's Grand Slam in 1930. Not only did Rice cover major tournaments, he also wrote columns on technique, on the importance of the left arm or a good grip in the golfer's swing.

Floncy had joined Lakeside when she moved to town, so Rice followed her. He played rounds with most of the famous faces at the club. It was inevitable that he would play with John Montague.

Rice's usual Lakeside partner was Guy Kibbee, the comedian, and they journeyed to the Riviera Country Club in Los Angeles one afternoon to be part of a sixsome with actor Frank Craven, Northwestern football coach Dick Hanley, Oliver Hardy and, yes, Montague. Rice had heard the stories about the incredible drives, about the dead birds and the baseball bat, shovel and rake, but he said he believed "only about 20 percent of them."

Within four hours, he believed them all. Montague's drives were the longest Rice ever had seen. The chips, the putts were almost perfect. Stepping onto the 18th tee, Montague needed only a par to shoot 61, which would set the Riviera course record. He then did the strangest thing. He

LEIGH MONTVILLE, *a former writer for* Sports Illustrated, *is the author of* The Mysterious Montague, *published last month.*

BETTMANN / CORBIS; ILLUSTRATION: BEN PERINI

JUDGMENT DAY
Montague's true identity was unmasked in 1937, when he was arrested in the robbery of the Hana Restaurant (top left) in the Adirondacks. He faced trial as LaVerne Moore (top right), and the jury (middle right) acquitted him. The judge protested, but the defendant exulted with his attorney James Noonan (bottom right), whose clients included Dutch Schultz. After reading his fan mail (bottom left), the exonerated man faced the question at the center of his legend: How good a golfer was he, really?

purposely hit a ball deep into the woods, told the caddie to pick it up and retired for the day.

Why'd you do that? Rice asked. You would have had the record.

I don't want the notoriety, the golfer explained.

The sportswriter had never seen anything like it. He left the course amazed. He had the thought, crazy as it seemed, that he had played a round with the best golfer in the world. Could that be? Could the best golfer in the world be someone who had never played in a tournament, someone unknown to the sports public, someone unknown even to Grantland Rice? He had to play with this guy again. And again. And again. And he did. And the feeling would not leave him.

John Montague was the best golfer in the world! Rice sat on his opinion for as long as he could, then did the only thing he could do. He was a sportswriter. He started writing.

"I have played several rounds with John Montagu in California and I'll take him as an even bet against any golfer you can name—over a championship course," Rice wrote in his column of January 18, 1935, misspelling Montague's name. "In the first place, he is around 30 years old. He is 5 feet, 10 inches in height and weighs 205 pounds. His physical power is amazing; a strength that is combined with litheness and muscle looseness. He is built like [wrestler] Jim Londos and is just about as strong.

"I played with him at Lakeside, Riviera and other hard courses around Los Angeles and he handled most of the long par-4 holes, from 430 to 450 yards, with a drive and a niblick [9-iron] over soft fairways. He has the grip of doom in his hands, which are like active steel. He has the ability to concentrate with a keen, alert mind.

CLOCKWISE FROM TOP RIGHT: BILL WALLACE / NEW YORK DAILY NEWS ARCHIVE; NEW YORK DAILY NEWS ARCHIVE (4)

HOME AND AWAY
Back in Syracuse, Montague reunited with his parents (far left), Mary and Matthew Moore. Of their two sons (left), the elder, Harold (at right), stayed put and raised a family. John Montague left town right after his acquittal and headed for Long Island, where he played in an exhibition (above) with Babe Ruth, Babe Didrikson and amateur Sylvia Annenberg. The event—intended to launch Montague's public career—was halted after nine holes because the overflow crowd got too unruly.

"He would be murder in an amateur championship—here or in Great Britain—and a distinct threat in any open."

The door to the outside world had been quietly unlocked. No great rush at John Montague came through, but his name and deeds were now on the public record. Like it or not, the process of scraping away his anonymity had begun. Rice wrote about him again before the year was out, claiming that the U.S. Amateur champion of 1936, whoever it was, would not be the best amateur in the country because John Montague was not entered.

Westbrook Pegler, a friend of Rice's, added a second, more dramatic voice. He brought the wonder story about the match with Crosby onto the printed page in September 1936. A former sportswriter, now a syndicated columnist with a brash and conservative voice, Pegler was enthralled by the mystery more than by the golf.

"Reports are to hand of a mighty man of sport who would seem to combine the fabulous prowess of Paul Bunyan, John Henry and Popeye the Sailor with the remarkable social knacks of Ivan Petrovsky Skovar, the Muscovite hero of the old college doggerel who could imitate Irving, tell fortunes with cards and sing to a Spanish guitar," Pegler reported. "The man's name is given as Johnny Montague and his field of operations is Hollywood, but it seems unlikely that our story is a publicity plant, for he avoids publicity and will not permit anyone to take his picture if he can prevent it."

Pegler's breathless account brought more attention. ("Can he make toast?" the columnist asked a source at the end of the column. "Can he make toast?" the source exclaimed. "Give him an egg and he will churn you up the best fried chicken you ever tasted.") Montague's name was soon appearing in the Los Angeles papers. People began asking questions.

Who was this guy? Was he as good as these two famous writers said he was? Where did he come from? What did he do for a living? *Time* magazine was among those who wanted to know.

The 13-year-old newsweekly sent not only a reporter, but also a photographer to the West Coast to bring back the story. The photographer hid behind a tree with a telephoto lens, captured a couple of fuzzy images. The reporter, rebuffed by his subject, compiled what facts or rumors he could.

Montague "lives in Beverly Hills with Comedian Oliver Hardy . . . , whom he can pick up with one hand," *Time* reported on January 25, 1937. "When not in residence with Hardy, he is 'somewhere in the desert,' where he is supposed to own a silver mine or gold mine. He has two Lincoln Zephyrs and a supercharged Ford, specially geared for speed. He is about 33, 5 ft. 10 in. 220 lb. He is built like a wrestler, with tremendous hands, bulldog shoulders and biceps half again as big as Jack Dempsey's. His face is handsome, disposition genial. He can consume abnormal quantities of whiskey. He frequently stays up all night and recently did so five nights in a row. He is naturally soft-spoken and dislikes hearing men swear in the presence of ladies."

Time liked to attach an identifying descriptor to last names: "Aviator Lindbergh," "Automaker Chrysler," "Cinemactor Gable." For Montague, it was "Mysterious Montague." The name stuck. Everyone seemed to be talking about Mysterious Montague.

There were reports of further feats. There were reports

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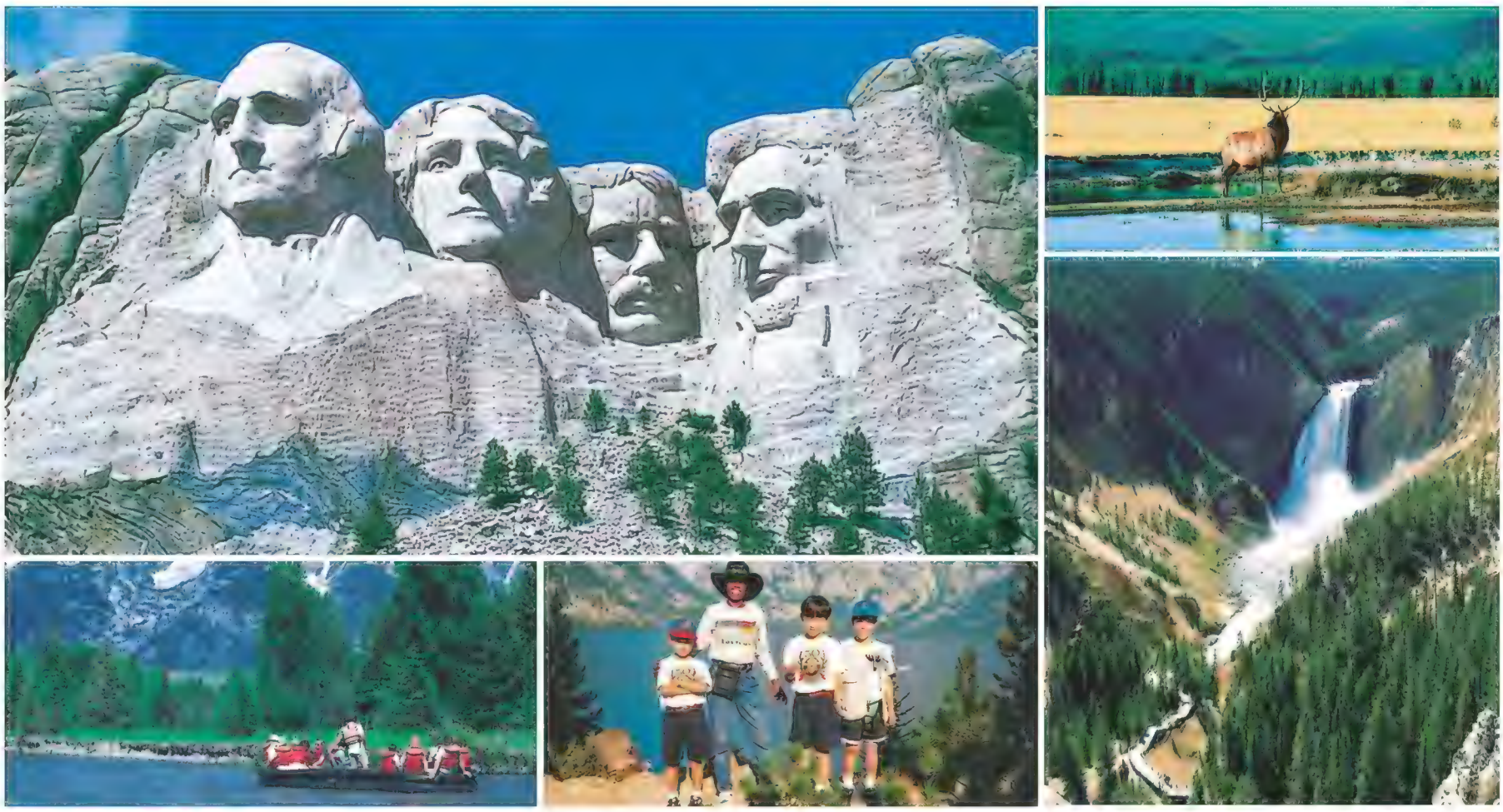

Clockwise starting top left: Mt. Rushmore, Yellowstone Park, Yellowstone Falls, Jenny Lake, floating on Snake River beneath the Grand Tetons

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that previous feats had been greatly exaggerated. There was an invitation to play in the British Open. There were rumors of a match for $50,000 against Bobby Jones, who would come out of retirement for it.

Grantland Rice's first crazy thought that the best golfer in the world might be someone the public had never seen, someone who had never entered a tournament, now ran through the sport. An editorial in the June 1937 issue of *American Golfer* basically dared John Montague to put up or shut up. The headline was "An Appeal to Mr. Montague."

"Today, the mystery surrounding him has reached such proportions as to become a menace to the reputations of those whose business is golf," the magazine stated. "We ask Mr. Montague to give the golfers of this country, a large percentage of which we represent, a fair opportunity to judge the true merits of his game. Such judgment can only be made by his appearance in competition."

What next?

Could Montague continue to hold out? Could he?

On July 9, 1937, the questions became moot.

New York State Police Inspector John Cosart, based in Oneida, had read the stories about this wonder golfer on the West Coast with increasing interest. He had slowly become convinced that John Montague, mysterious golfer, was really LaVerne Moore of Syracuse, a former minor-league pitcher, reputed rumrunner and great golfer wanted for an armed robbery in the Adirondacks almost seven years before.

Montague was arrested at his home. He readily admitted that he was LaVerne Moore. The *Los Angeles Times* reported that when booked, "he was nattily attired in brown sports coat, striped white slacks, two-tone brown shoes, brown swagger hat and accessories to blend." He had $43 and change in his pockets.

MONTAGUE'S HOLLYWOOD friends, especially Crosby and Hardy, backed him with big-time lawyers, Jerry Giesler in Hollywood, then James M. Noonan in New York. Noonan had defended Arthur Flegenheimer, better known as Dutch Schultz, and brought home a hung jury and an acquittal on charges of income-tax evasion. Montague fought extradition from California for a while, saw he was not going to win, then surrendered to New York authorities.

His trial was held in October 1937, in the sleepy Adirondacks burg of Elizabethtown. The New York City newspapers sent their best reporters and columnists, and the action was played prominently on the front pages. The *New York Mirror* called it "the first big sports-page trial since the Black Sox scandal" of the 1919 World Series. Montague was accused of being the fourth man in a Prohibition-era robbery of a roadhouse restaurant and speakeasy that netted some $700. One of the other robbers had been killed in a high-speed chase after the event. The other two had not only been arrested but had already been tried, convicted and incarcerated.

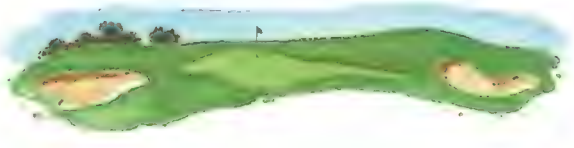
After high theatrics in the courtroom—one of the robbers claimed Montague was part of the group, one didn't; Montague's mother claimed he was asleep, home in bed, the night of the robbery—the trial ended in acquittal. The judge in the case, Harry Owen, was so upset he told the jurors their verdict was "not in accord with the one that I think you should have returned," but the defendant was carried from the courtroom on the shoulders of his supporters. His celebrity generally was thought to have influenced the decision.

FAMOUS LONG AGO
Never making the pro tour, Montague lived off his legend.

Freed, able to speak and have his picture taken, he now promised to attack his sport and make his reputation. Alas, he was now 34 years old. He had added a lot of weight and had not played very much golf in the previous two years.

A month after the trial, he played a memorable exhibition round of golf with Babe Ruth and Babe Didrikson and amateur Sylvia Annenberg at the Fresh Meadow Country Club in Flushing, on Long Island, a charity event that attracted such a large and raucous crowd it had to be canceled after nine holes. But that was the highlight of his public career. He never went on the pro tour. He qualified for the U.S. Open in 1940 but shot 80 on the first day, 82 on the second, and missed the cut by nine shots.

FREED, ABLE TO SPEAK AND HAVE HIS PICTURE TAKEN, HE PROMISED TO ATTACK HIS SPORT AND MAKE HIS NAME. BUT HE WAS NOW 34.



He played most of his golf in exhibitions, where he hit a number of trick shots and lived on the last vapors of his fame. When they, too, disappeared, he disappeared from the scene. He died of heart problems in a room at a residence motel in Studio City, California, in 1972. He was 68 years old.

The final mystery of the Mysterious Montague—how good he was—was never answered. Grantland Rice, three months before his own death, in 1954, wrote, "A great many will tell you that Montague, originally a Syracuse boy, was overplayed. That isn't true." Rice was a believer to the end.

ARTHUR B. ABRAMS; ILLUSTRATION: BEN PERINI

Learn more about Leigh Montville's search for the mysterious Montague at Smithsonian.com/montville

On the Origin of a Theory

Charles Darwin's bid for enduring fame was sparked 150 years ago by word of a rival's research **BY RICHARD CONNIFF**

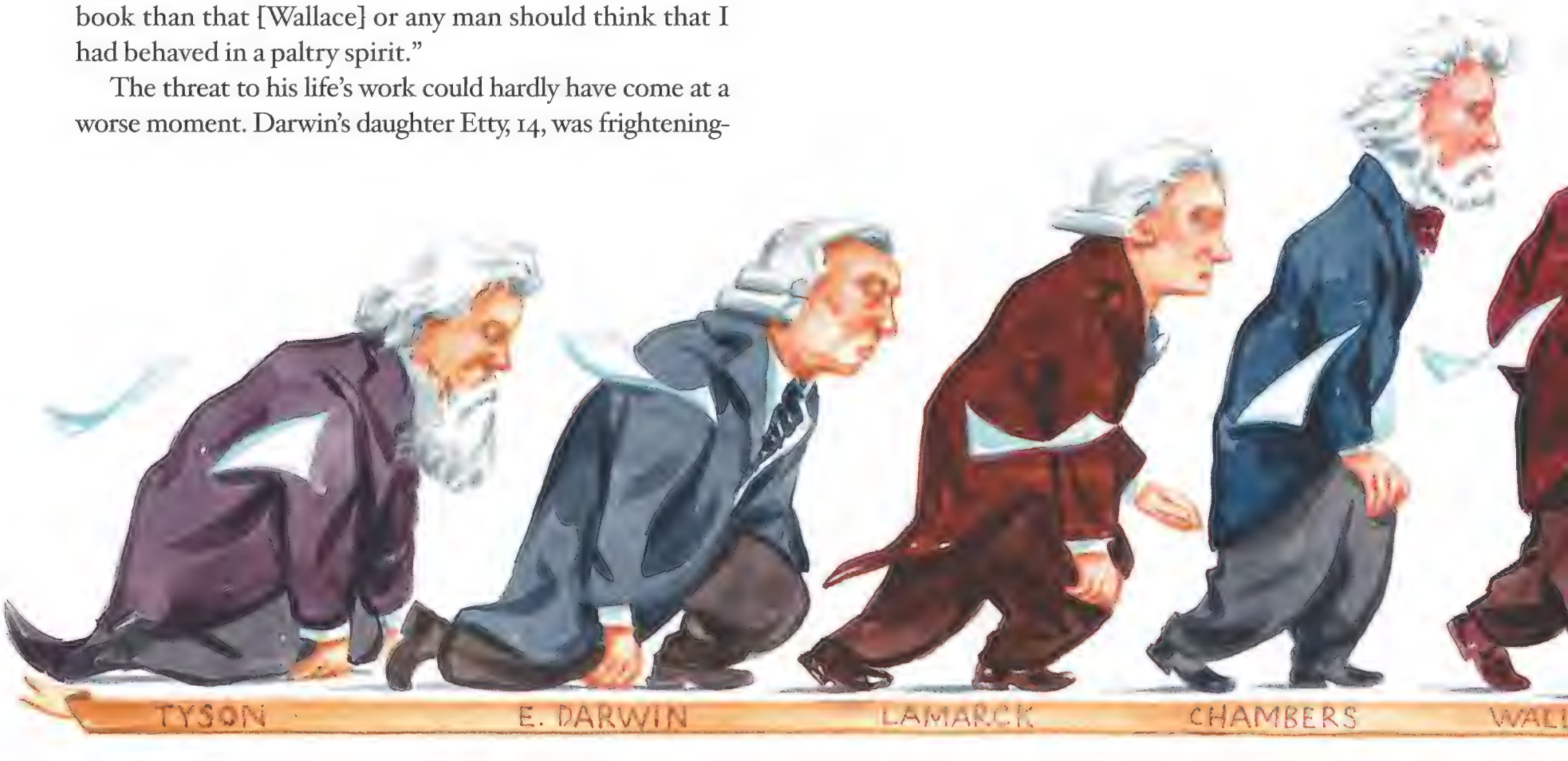
LEAFING THROUGH THE MAIL at his home outside London one June day 150 years ago, Charles Darwin came across an envelope sent from an island in what is now part of Indonesia. The writer was a young acquaintance, Alfred Russel Wallace, who eked out a living as a biological collector, sending butterflies, bird skins and other specimens back to England. This time, Wallace had sent along a 20-page manuscript, requesting that Darwin show it to other members of the British scientific community.

As he read, Darwin saw with dawning horror that the author had arrived at the same evolutionary theory he had been working on, without publishing a word, for 20 years. "All my originality, whatever it may amount to, will be smashed," he lamented in a note to his friend the geologist Charles Lyell. Darwin ventured that he would be "extremely glad now" to publish a brief account of his own lengthy manuscript, but that "I would far rather burn my whole book than that [Wallace] or any man should think that I had behaved in a paltry spirit."

The threat to his life's work could hardly have come at a worse moment. Darwin's daughter Etty, 14, was frighteningly ill with diphtheria. His 18-month-old son, Charles, would soon lie dead of scarlet fever. Lyell and another Darwin friend, the botanist Joseph Hooker, cobbled together a compromise, rushing both Darwin's and Wallace's works before a meeting of the Linnean Society a few days later, on July 1, 1858. The reading took place in a narrow, stuffy ballroom at Burlington House, just off Piccadilly Circus, and neither author was present. (Darwin was at his son's funeral; Wallace was in New Guinea.) Nor was there any discussion. The society's president went home muttering about the lack of any "striking discoveries" that year. And so began the greatest revolution in the history of science.

We call it Darwinism, for short. But in truth, it didn't start with Darwin, or with Wallace either, for that matter. Great ideas seldom arise in the romantic way we like to imagine—the bolt from the blue, the lone genius running through the streets crying, "Eureka!" Like evolution itself,

PP. 86-87 TIM BOWER



science more often advances by small steps, with different lines converging on the same solution.

"The only novelty in my work is the attempt to explain *how* species become modified," Darwin later wrote. He did not mean to belittle his achievement. The *how*, backed up by an abundance of evidence, was crucial: nature throws up endless biological variations, and they either flourish or fade away in the face of disease, hunger, predation and other factors. Darwin's term for it was "natural selection"; Wallace called it the "struggle for existence." But we often act today as if Darwin invented the idea of evolution itself, including the theory that human beings developed from an ape ancestor. And Wallace we forget altogether.

In fact, scientists had been talking about our primate origins at least since 1699, after the London physician Edward Tyson dissected a chimpanzee and documented a disturbing likeness to human anatomy. And the idea of evolution had been around for generations.

In the 1770s, Darwin's grandfather Erasmus Darwin, a physician and philosopher, publicly declared that different species had evolved from a common ancestor. He even had the motto

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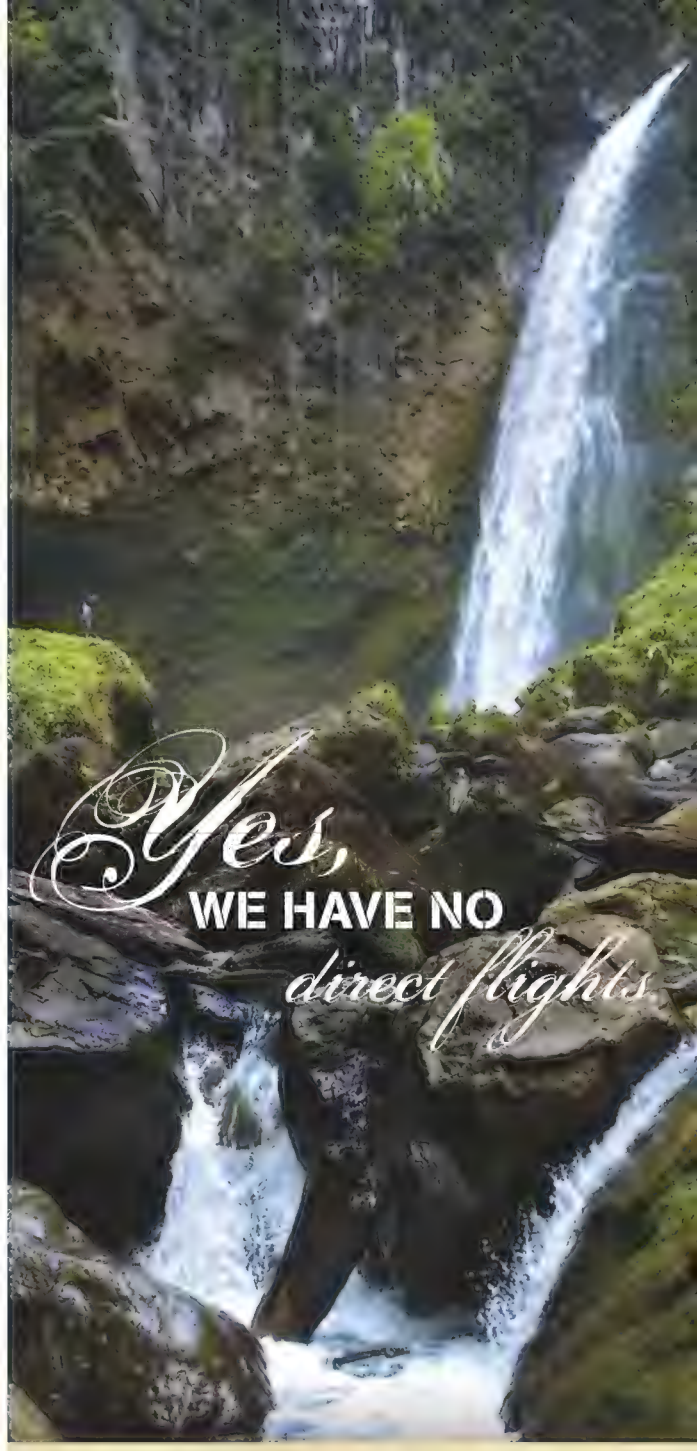

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Jean-Baptiste Lamarck's 1801 theory held that giraffes got long necks by wanting or needing them. Darwin's achievement was to explain the mechanism of it.

"E conchis omnia" ("Everything from shells") painted on his carriage, prompting a local clergyman to lambaste him in verse:

Great wizard he! by magic spells
Can all things raise from cockle shells.

In the 1794 book of his two-volume *Zoonomia*, the elder Darwin ventured that over the course of "perhaps millions of ages . . . all warm-blooded animals have arisen from one living filament," acquiring new traits and passing down improvements from generation to generation.

His contemporary Samuel Taylor Coleridge mocked this sort of evolutionary theory as "darwinizing." But it was by no means a family monopoly. Evolutionary questions confronted almost all naturalists of that era as expeditions to distant lands discovered a bewildering variety of plants and animals. Fossils were also turning up in the backyard, threatening the biblical account of Creation with evidence that some species had gone extinct and been supplanted by new species. The only way to make sense of these discoveries was to put similar species side by side and sort out the subtle differences.

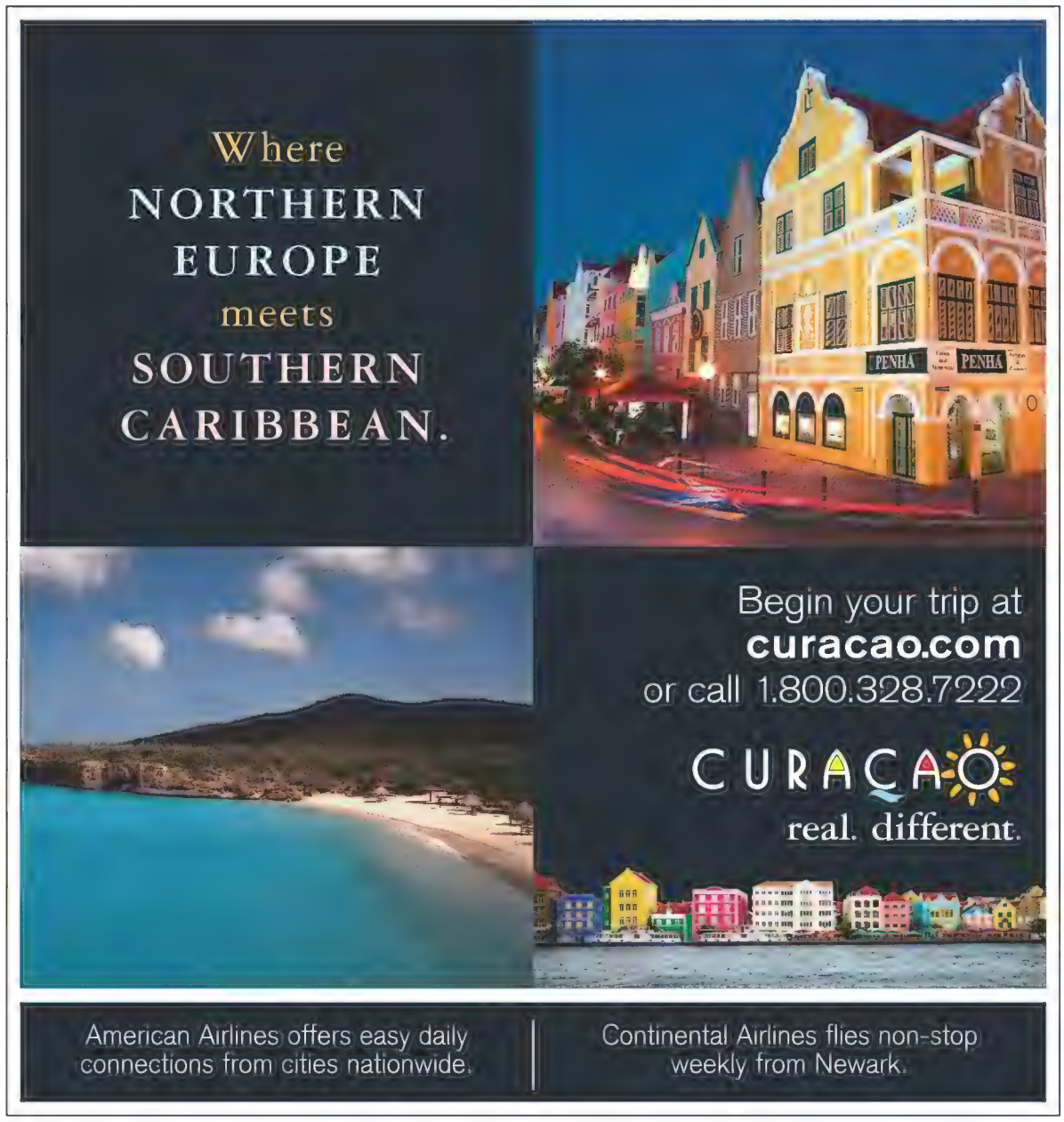
AGE FOTOSTOCK

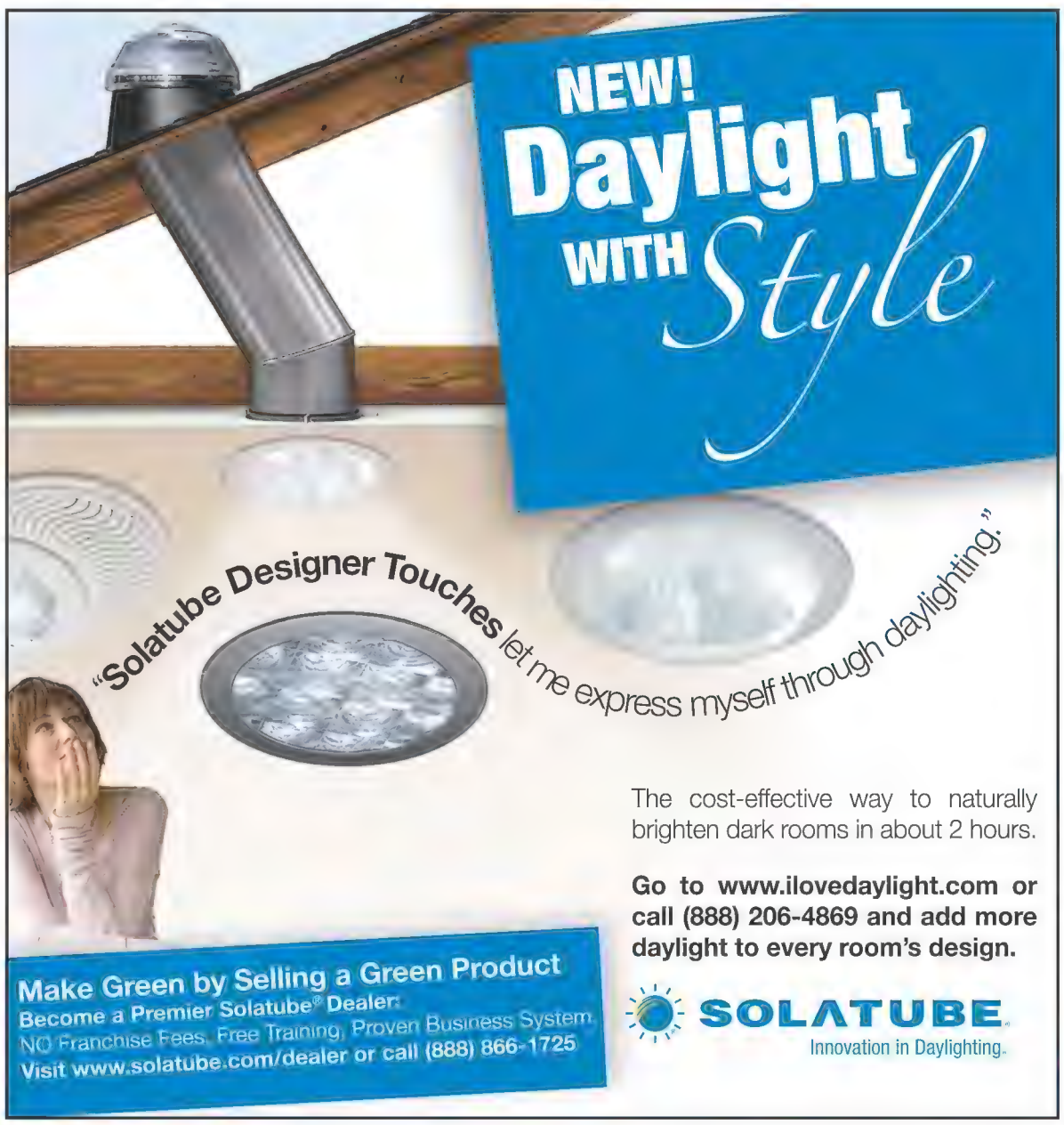
These comparisons led "transmutationists" to wonder if species might gradually evolve over time, instead of having a fixed, God-given form.

In 1801, the French naturalist Jean-Baptiste Lamarck proposed that species could change in response to environmental conditions. Giraffes, for instance, had developed their fantastic necks to browse on the upper branches of trees. Lamarck mistakenly thought such traits could be acquired by one generation and passed on to the next. He is ridiculed, to this day, for suggesting that giraffes got their longer necks basically by *wanting* them (though the word he used, some scholars contend, is more accurately translated as "*needing*"). But his was the first real theory of evolution. If he had merely suggested that competition for treetop foliage could gradually put short-necked giraffes at a disadvantage, we might now be talking about Lamarckian, rather than Darwinian, evolution.

By the 1840s, evolutionary ideas had broken out of the scientific community and into heated public debate. The sensation of 1845 was the anonymous tract *Vestiges of the Natural History of Creation*, and it set both Darwin and Wallace on career paths that would converge in that fateful 1858 mail delivery. *Vestiges* deftly wove evolutionary ideas into a sweeping history of the cosmos, beginning in some primordial "fire-mist." The author, later revealed to be the Edinburgh journalist and publisher Robert Chambers, argued that humans had arisen from monkeys and apes, but he also appealed to ordinary readers with the uplifting message that evolution was about progress and improvement.

Vestiges quickly became a popular hit, a rose-tinted *2001: A Space Odyssey* of its day. Prince Albert read it aloud to Queen Victoria at Buckingham Palace, and it was the talk of every gentlemen's club and social soiree, according to James A. Secord, author of *Victorian Sensation*. Jocular types greeted each other on the street with phrases like, "Well, son of a cabbage, whither art thou progressing?" Others took evolu-

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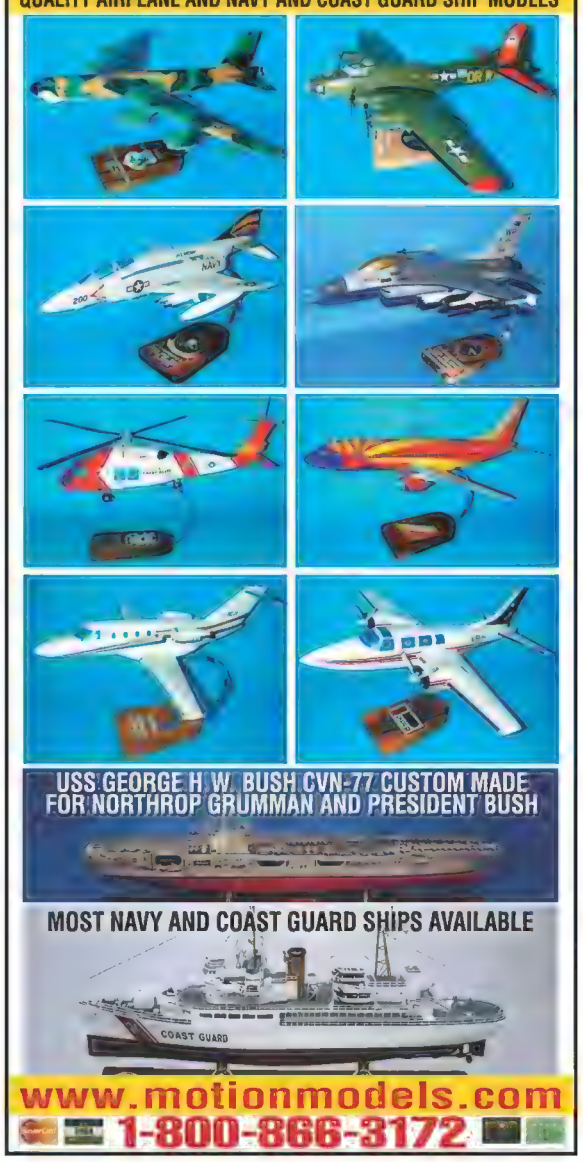
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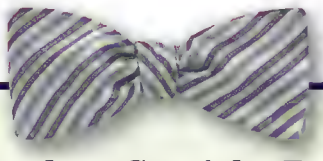

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tion more seriously. On a museum visit, Florence Nightingale noticed that small flightless birds of the modern genus *Apteryx* had vestigial wings like those of the giant moa, an extinct bird that had recently been discovered. One species ran into another, she remarked, much "as *Vestiges* would have it."

Clergymen railed from the pulpit against such thinking. But scientists, too, hated *Vestiges* for its loose speculation and careless use of facts. One indignant geologist set out to stamp "with an iron heel upon the head of the filthy abortion, and put an end to its crawlings." In Cambridge, at a meeting of the British Association for the Advancement of Science, an astronomer criticized the book's failure to explain *how* evolution might have occurred; *Vestiges*, in his view, was about as miraculous as the biblical account of Creation. (During this attack, the author, still anonymous, sat in the front row, probably trying not to squirm.) Even Darwin disliked what he called "that strange unphilosophical, but capitally-written book." He confided to a friend that the author's "geology strikes me as bad, & his zoology far worse."

Darwin had begun to develop his own theory of evolution seven years earlier, in 1838, while reading the demographer T. R. Malthus on factors limiting human population growth. It dawned on him that, among animals, hunger, predation and other "checks" on population could provide "a force like a hundred thousand wedges," thrusting out weaker individuals and creating gaps where better-adapted individuals could thrive. By 1844, he had expanded this idea into a manuscript of more than 200 pages.

But *Vestiges* heightened Darwin's characteristic caution. He hesitated to publish partly because radicals were taking up evolutionary theory as a way to undermine the idea of a divinely ordained social hierarchy. Darwin himself sat comfortably in the upper ranks of that hierarchy; he had inherited wealth, and his closest colleagues were other gentlemen naturalists, including the clergy. Admitting transmutationist

Despite years of labor, Darwin (showing an ape how closely he and it resemble each other, in an undated drawing) could not escape ridicule for his theory.

beliefs in these circles, Darwin had written to his friend Hooker, would be like "confessing a murder." But beyond that, he also hesitated because the abuse being heaped onto *Vestiges* drove home the need for detailed evidence. Darwin, at age 37, backed away from theorizing and settled down to describing the minute differences within one invertebrate group: the barnacles. He would spend the next eight years at it, at some peril to his sanity.

Wallace was more receptive to *Vestiges*. He was just 22 when the controversy raged. He also came from a downwardly mobile family and had a penchant for progressive political causes. But *Vestiges* led him to the same conclusion about what needed to be done next. "I do not consider it as a hasty generalization," Wallace wrote to a friend, "but rather as an ingenious speculation" in need of more facts and further research. Later he added, "I begin to feel rather dissatisfied with a mere local collection. . . . I should like to take some one family to study thoroughly—principally with a view to the theory of the origin of species." In

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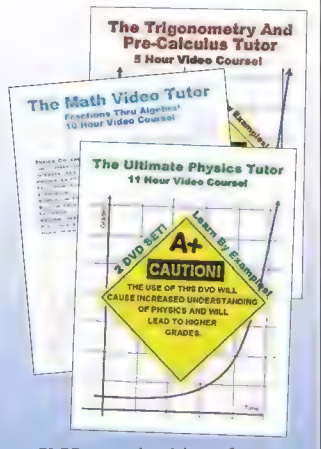

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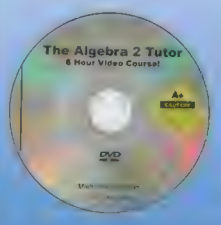

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April 1848, having saved £100 from his wages as a railroad surveyor, he and a fellow collector sailed for the Amazon. From then on, Wallace and Darwin were asking the same fundamental questions.

Ideas that seem obvious in retrospect are anything but in real life. As Wallace collected on both sides of the Amazon, he began to think about the distribution of species and whether geographic barriers, such as a river, could be a key to their formation. Traveling on HMS *Beagle* as a young naturalist, Darwin had also wondered about species distribution in the Galápagos Islands. But pinning down the details was tedious work. As he sorted through the barnacles of the world in 1850, Darwin muttered darkly about "this confounded variation." Two years later, still tangled up in taxonomic minutiae, he exclaimed, "I hate a Barnacle as no man ever did before."

Wallace was returning from the Amazon in 1852, after four years of hard collecting, when his ship caught fire and sank, taking down drawings, notes, journals and what he told a friend were "hundreds of new and beautiful species." But Wallace was as optimistic as Darwin was cautious, and soon headed off on another collecting expedition, to the islands of Southeast Asia. In 1856, he published his first paper on evolution, focusing on the island distribution of closely related species—but leaving out the critical issue of *how* one species might have evolved from its neighbors. Alarmed, Darwin's friends urged him to get on with his book.

By now, the two men were corresponding. Wallace sent specimens; Darwin replied with encouragement. He also gently warned Wallace off: "This summer will make the 20th year (!) since I opened my first-note-book" on the species question, he wrote, adding that it might take two more years to go to press. Events threatened to bypass them both. In England, a furious debate erupted about whether there were significant structural differences between the brains of humans and gorillas, a species discovered by science only ten years ear-

lier. Other researchers had lately found the fossil remains of brutal-looking humans, the Neanderthals, in Europe itself.

Eight thousand miles away, on an island called Gilolo, Wallace spent much of February 1858 wrapped in blankets against the alternating hot and cold fits of malaria. He passed the time mulling over the species question, and one day, the same book that had inspired Darwin came to mind—Malthus' *Essay on the Principle of Population*. "It occurred to me to ask the question, Why do some die and some live?" he later recalled. Thinking about how the healthiest individuals survive disease, and the strongest or swiftest escape from predators, "it suddenly flashed upon me . . . in every generation the inferior would inevitably be killed off and the superior would remain—that is, the fittest would survive." Over the next three days, literally in a fever, he wrote out the idea and posted it to Darwin.

Less than two years later, on November 22, 1859, Darwin published his great work *On the Origin of Species by Means of Natural Selection*, and the unthinkable—that man was descended from beasts—became more than thinkable. Darwin didn't just supply the *how* of evolution; his painstaking work on barnacles and other species made the idea plausible. Characteristically, Darwin gave credit to Wallace, and also to Malthus, Lamarck and even the anonymous "Mr. Vestiges." Reading the book, which Darwin sent to him in New Guinea, Wallace was plainly thrilled: "Mr. Darwin has given the world a new science, and his name should, in my opinion, stand above that of every philosopher of ancient or modern times."

Wallace seems to have felt no twinge of envy or possessiveness about the idea that would bring Darwin such renown. Alfred Russel Wallace had made the postman knock, and that was apparently enough.

RICHARD CONNIFF *is a longtime contributor to* SMITHSONIAN *and the author of* The Ape in the Corner Office.

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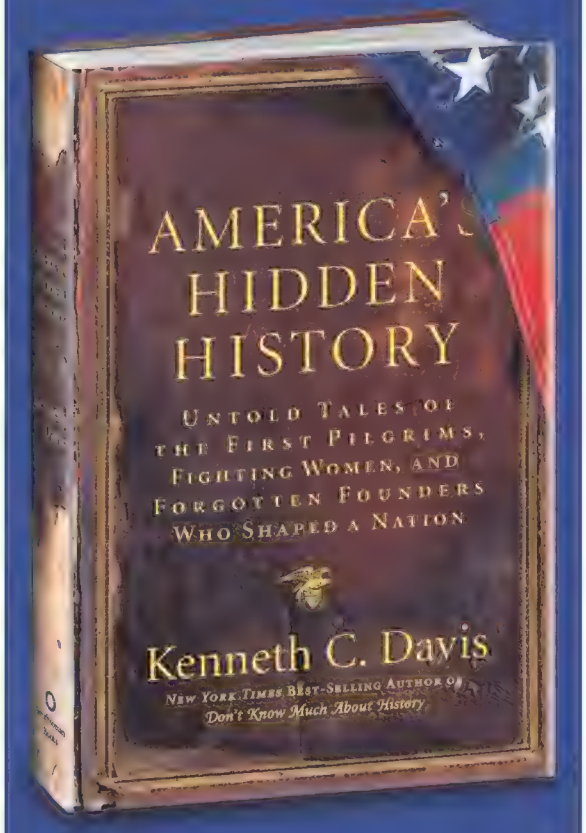
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Theoretical physics has been hopelessly stalled for over 30 years. Moribund. Ossified. The Standard Model of particle physics uses over 20 ad hoc constants, and no one knows why they are necessary or why they have the values they do. Quantum physics and general relativity remain utterly incompatible. Cosmologists haven't the foggiest idea what could have caused the Big Bang or what, if anything, came before it. And finally, after over 30 years of effort, string theory hasn't even achieved the status of *science*.

There is a very simple reason for this catastrophic, intractable mess. Theorists stopped asking *why* a long time ago. Without the *why*, the search for mathematical symmetries becomes numerology, not science. No telescope or particle accelerator, regardless of its size, is going to tell us *why* the universe is the way it is. When the *why*'s remain unanswered, there is no understanding. When there is no understanding, there is no progress. But this sad situation is about to change forever.

Our Undiscovered Universe is all about the *why*. It's an entirely new paradigm, a premise so powerful that it can finally answer the most important question of all: "*Why does the universe exist?*" This, in turn, reveals many of nature's secrets to a depth and clarity never before imagined.

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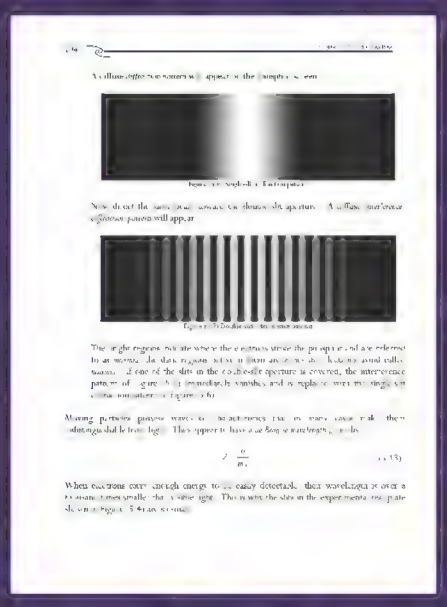
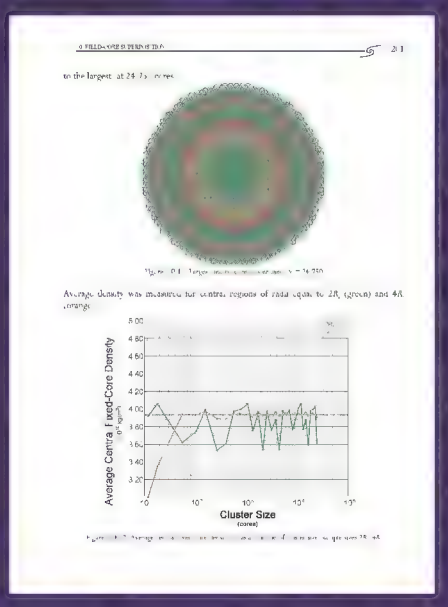
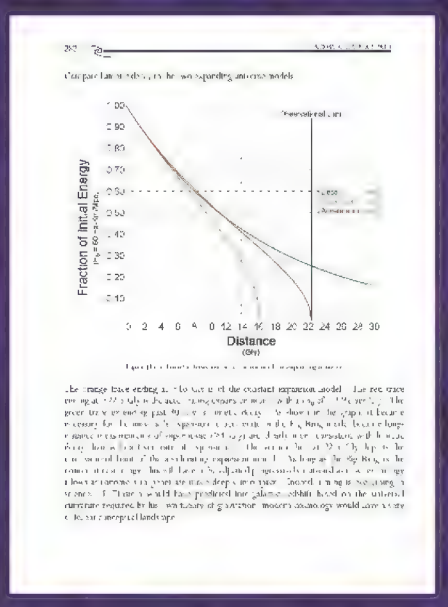
100 years ago, Einstein found a small part of the universe's four-dimensional geometry. Null Physics provides the rest of it. After reading this book, concepts like string theory and the Big Bang will seem positively ludicrous in comparison. Here is a brief glimpse of its sweeping unification:

- Energy is a three-dimensional substance, and its most basic unit is time-distance^2.
- Our universe has only a single fundamental constant: its finite, four-dimensional volume.
- A black hole's peak density is $1.2(10)^{19}$ kg/m^3, about 60 times more dense than atomic nuclei.

Welcome to 21st century physics




Average density was measured for central regions of radii equal to 2R (green) and 4R (orange)
Average Central Fixed-Core Density
Cluster Size
(cores)



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- ❑ High Blood Pressure
- ❑ Arthritis
- ❑ Fibromyalgia
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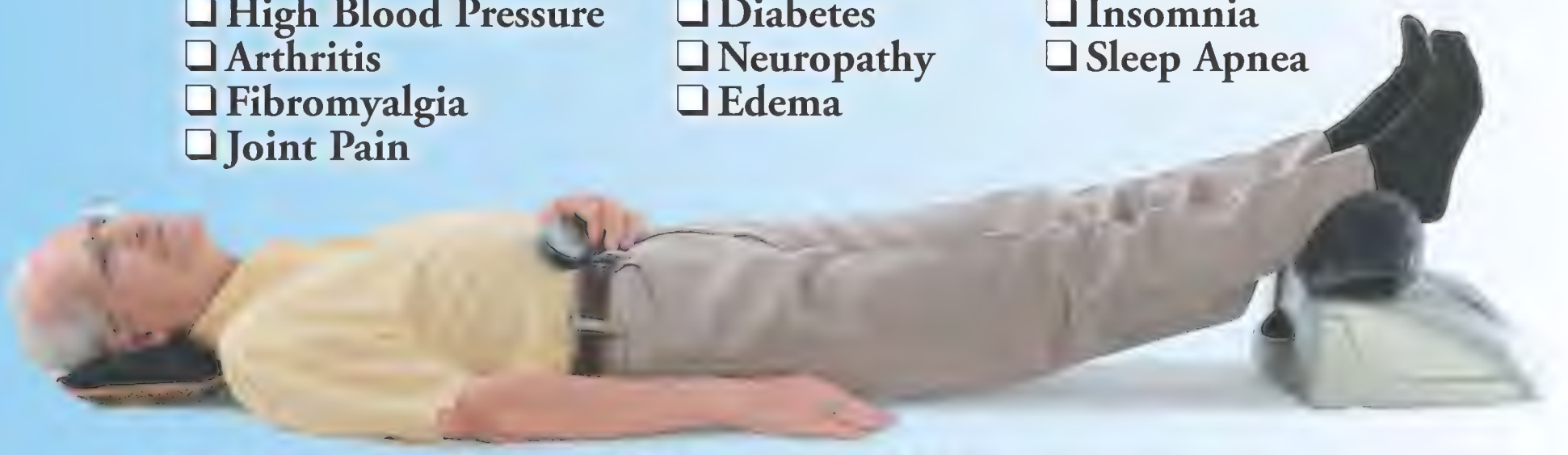
- ❑ Constipation
- ❑ Back Pain
- ❑ Diabetes
- ❑ Neuropathy
- ❑ Edema
- ❑ Stiff Muscles
- ❑ Poor Circulation
- ❑ Insomnia
- ❑ Sleep Apnea



You will enjoy using the Exerciser 2000 *Elite*™

Receive some of the benefits of aerobic exercise without stress or impact on the joints!

How Does the Exerciser 2000 Elite™ Work?

Enjoy the benefits of passive exercise—just lie down, place your ankles on the ankle rest and let the machine do the work.

When you turn the machine on, it creates a 2 inch, right to left movement that gently moves the body back and forth.

This gentle swinging motion cycles up through the whole body, creating an exercise movement without stress or impact on the joints.

- Relaxation of the back muscles
- Oxygenation of the blood
- Increased mobility
- Increase circulation throughout the body
- Helps relieve stiffness from head to toe

Features

- Weighs only 15 pounds
- 15" wide x 13.5" deep x 9.5" high
- ISO-9001 Certified
- FDA Class 1 Registered
- ETL Approval
- 5-speed operation
- 2 pre-programmed selections —one for relaxation and one for energizing
- Heavy duty, high torque DC motor
- Wide cushioned ankle rest
- 16 minute digital timer with safety shut-off
- **4 year parts and labor warranty**

These statements have not been evaluated by the FDA.
Not intended to treat, cure or prevent any diseases.

Don't be fooled by cheap imitations

What people are saying about the Exerciser 2000 Elite™

After using the Exerciser 2000 Elite™ twice a day for one week the swelling in my ankles went away. It has also helped my breathing, as I can get out and walk without having to stop and catch my breath! Thank you. —*Shirley H., Florida*

After having a stroke, I could no longer exercise the way I used to. As a result, I developed edema. A friend of mine introduced me to the Exerciser 2000 Elite™. I loved it and I purchased one for myself. After using the machine daily for a few weeks, my symptoms of edema were completely gone. I now use the machine twice a day for 16 minutes each time on speed 3. What a wonderful way to exercise.—*Robert M.*

I am in my late 80's and have diabetes. The first thing I noticed when I started using my machine was that my feet were warm when I went to bed. They were always ice cold before. Because one of my problems is poor circulation, I use the machine three times a day for 10 minutes each; in the morning, late afternoon and just before bed. I almost forgot to mention that I have not been able to lift my arms above my head. Now I can do it. You think that's no big deal until you can't do it anymore. —*Ralph K.*

As a Chiropractor, I would like to say that the Exerciser 2000 Elite™ enables people to benefit themselves at home. It is a valuable asset in moving lymph fluid, oxygenating the blood, increasing immune system function, maintaining mobility in the spine, and additionally freeing up a spine that has become stiff and arthritic. —*Garry Gorsuch, D.C.*

I love using the Exerciser 2000 Elite™ after my morning workout. It is an excellent way to cool down and it helps to start my day off right.—*Deanna C., Kansas*

My husband and I have been into natural products all of our lives but nothing has ever affected us like the Exerciser 2000 Elite™. My husband is 72 and delivers flowers. He carries 5 gallon buckets of water. Since using the machine, his back hasn't hurt him at all. My hips would hurt if I stood too long and I would get weak and have to sit down. Now I can walk and sit as long as I want. I don't take pain medication anymore. In the morning, when I get out of bed I'm not stiff anymore. At 65, wow, this is great! Thank you for offering such a great machine. We are going to tell everyone we know about it. —*Cheryl J.*

The ad I saw almost sounded "too good to be true". With your no risk money back guarantee I figured I had nothing to lose so I purchased the machine… and boy, am I glad I did! I am 75 years old and suffer from sciatica, which makes my back and legs tighten up and causes numbness. I was taking 8-10 Aleve™ every day. After using the machine for only 4 minutes, I noticed my lower back loosening up. Since I have been using the machine I haven't taken any pain pills and have been pain free. My sciatica is not giving me problems anymore and my body stays loosened up. I have also had a snoring problem for quite some time, however, since using the machine my snoring has subsided. My wife is so excited! I cannot tell you how much this machine has turned my life around. —*C. Cummings*

I have had constipation problems for over 25 years. Since I have been using the Exerciser 2000 Elite™ I have been regular every day and have begun to lose weight. This is truly a blessing and is so easy to use. —*Jeannie*

I had suffered with sleep apnea for many years and had been taking drugs for it. I was told I would have to use a breathing apparatus. In the meantime, I was introduced to the Exerciser 2000 Elite™ and decided to purchase one. Within two weeks, I was sleeping more deeply and restfully than ever before. —*David B.*

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Picture a society in which there is no conflict, no jealousy, no unkind words. A society in which people think, say, and do what is rational and honest, resulting in behavior that is trustworthy and productive.

Richard W. Wetherill
1906-1989

Enlarge the picture of that society to include persons holding no grudges and nobody competing to exert control, as everybody's behavior conforms to a natural law. That society is composed of people who have learned to think, say, and do what is appropriate for the situation.

Picture additional descriptions of that society. People's activities are unsupervised because they do what reality calls for. There are no locks on doors or windows, no lengthy legal documents to assure honest behavior, no addictions, no poverty, no crime, and no deprivation of any rightful thing or opportunity.

There are no scoldings or punishments and no stress, causing sickness and death. There is liberation of men, women and children of every race from the tyranny of judgments and prejudice. There is plentiful food and shelter. There are new means of nonpolluting transportation. In this future society there is full employment with unique opportunities for all.

More important, there is fellowship among all people. There are neither strangers nor anybody to fear. There is stimulating activity as people reason from reality to learn from it and to be guided by it.

Daily life becomes an exciting adventure for the benefit of all. Since conflicting thoughts have left people's minds, there are no upheavals of nature. Weather conditions are orderly and occur appropriately.

There are spectacular accomplishments, as people consult nature's storehouse of knowledge. No prizes are awarded, as everybody is attending the ***university of life*** and learning from its boundless source.

The question is: What could create that society? The answer is: Conforming to nature's law of behavior created by whoever or whatever created that law. A law identified by the late Richard W. Wetherill who called it the ***law of absolute right***: ***Right action gets right results; wrong action gets wrong results.*** The law defines right action as logical, rational, and honest; wrong action as illogical, irrational, and dishonest. At present writing, six billion people trying to get their own contradictory ways have unknowingly produced the societal chaos being experienced worldwide.

Conforming to the principles of the behavioral law creates a harmonious society. It is not created by human intelligence. It was not created in thousands of decades by mankind's teachings, religions, or governments. A harmonious society is created by conformance to creation's ***law of absolute right***.

Scientific research and discovery require studying various aspects of nature to learn the principles involved and their functions. For example, researchers have mapped our body's DNA, mapped the earth, space, the tectonic plates, the ocean floor, and surveyed volcanic eruptions.

To acquire knowledge and dispel beliefs, researchers invariably study nature. Whoever or whatever created natural laws also included a behavioral law to establish peaceful, orderly human affairs. Conforming to that law enables people to behave as never before. They will be the survivors who bring to fruition a perfectly performing society!

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Text by E. Marie Bothe, President of The Alpha Publishing House.

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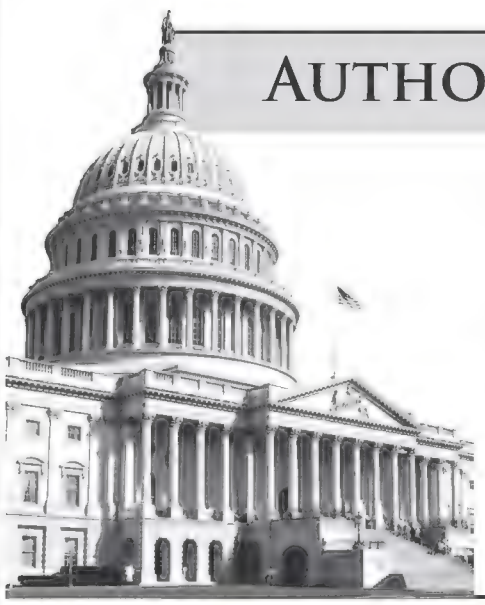
U.S. Gov't Issued American Eagle Gold Coins

Coins enlarged to show detail.



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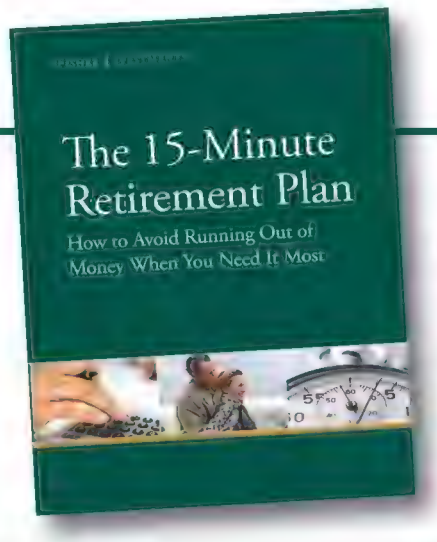

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Olay® Regenerist[1]	NO	NO	NO
Strivection SD®[2]	NO	YES	NO
La Mer™[4]	NO	NO	NO
Hydroxatone®	YES	YES	YES

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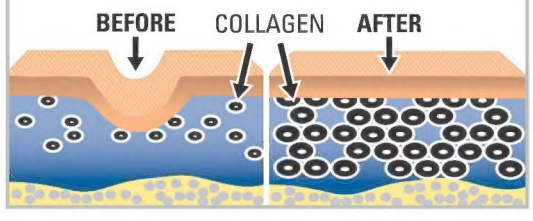

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Moses at the Bat

In the Big Inning . . .

BY HYMAN BARAS

WHILE BASEBALL is generally considered a "modern" sport, there are references in the Bible that could lead one to deduce that, in fact, there were Giants in those days as well:

And Abner said to Joab, "Let the young men . . . arise and play before us" **(II SAMUEL 2:14)**
. . . [and] all the people rose up . . . **(EXODUS 33:8)**
And Jehoshaphat the son of Ahilud was the recorder; and Sheva was scribe . . . **(II SAMUEL 20:24-25)**
And they said unto Jephthah, "Come and be our [Captain]" **(JUDGES 11:6)**
. . . and he measured two lines . . . **(II SAMUEL 8:2)**
And he set the bases . . . **(I KINGS 7:39)**
And they stood every man in his place round about the camp **(JUDGES 7:21)**
. . . behold, Rebekah came forth with her pitcher . . . **(GENESIS 24:45)**
Ehud . . . the Benjamite, a man left-handed . . . **(JUDGES 3:15)**
. . . the children of Israel . . . said "Who shall go up for us first . . . ?" **(JUDGES 20:18)**
. . . seek out a man who is a skillful player . . . **(I SAMUEL 16:16)**
. . . Judah [shall go up] first . . . **(JUDGES 20:18)**
[And] Judah took . . . **(JUDGES 1:18)**
Three times . . . **(EXODUS 23:14)**
. . . and . . . it was good. **(GENESIS 1:10)**
. . . and Abram went down . . . **(GENESIS 12:10)**
. . . out at the base . . . **(LEVITICUS 4:18)**
And Moses . . . smote . . . **(EXODUS 7:20)**
. . . and . . . [it] became foul . . . **(EXODUS 7:21)**
And Moses went out . . . **(NUMBERS 11:24)**
. . . and none came in. **(JOSHUA 6:1)**
And there was not a man left . . . **(JOSHUA 8:17)**
And Miriam was shut out . . . **(NUMBERS 12:15)**
And the children of Benjamin went out . . . **(JUDGES 20:31)**
. . . and went into the field . . . **(NUMBERS 22:23)**
And . . . Aaron waved . . . **(LEVITICUS 9:21)**
And he looked this way and that way . . . **(EXODUS 2:12)**
. . . and [he] delivered up . . . **(NUMBERS 21:3)**
. . . and they ran as soon as he had stretched out his hand. . . **(JOSHUA 8:19)**
. . . and they fell on their faces to the ground . . . **(JUDGES 13:20)**
Get thee up; wherefore now art thou fallen upon thy face? **(JOSHUA 7:10)**
. . . for it was an error . . . **(NUMBERS 15:25)**
. . . second and third . . . **(GENESIS 6:16)**
And Joseph [spoke] . . . **(GENESIS 45:3)**
. . . concerning the error which he committed . . . **(LEVITICUS 5:18)**
. . . make [an] atonement for thyself . . . **(LEVITICUS 9:7)**
Thou shalt fan them . . . **(ISAIAH 41:16)**
Then Joseph commanded to fill their . . . sack[s] . . . **(GENESIS 42:25)**
and . . . all the people saw it [and] they shouted . . . **(LEVITICUS 9:24)**
"Who can stand before the [Giants]?" **(DEUTERONOMY 9:2)**
and . . . Aaron waved . . . **(LEVITICUS 9:21)**
. . . and pitched on the other side . . . **(NUMBERS 21:13)**
. . . and suffered not a man to pass . . . **(JUDGES 3:28)**
. . . but . . . the seventh . . . **(EXODUS 31:15)**
Gideon . . . smote . . . **(JUDGES 8:11)**
. . . Israel . . . at . . . first . . . **(JEREMIAH 33:7)**
And Noah went in . . . **(GENESIS 7:7)**
And there ran a young man . . . **(NUMBERS 11:27)**
. . . he turned and went back . . . **(JUDGES 18:26)**
. . . unto the base . . . **(NUMBERS 8:4)**
. . . Noah walked . . . **(GENESIS 6:9)**
Let us go and sacrifice . . . **(EXODUS 5:8)**
And Moses lifted up his hand and smote . . . with his rod . . . **(NUMBERS 20:11)**
. . . the . . . hide . . . **(LEVITICUS 20:4)**
. . . a long blast . . . **(JOSHUA 6:5)**
. . . [outside] the camp . . . **(JUDGES 7:17)**
. . . [for] an 'omer . . . **(EXODUS 16:36)**
And the men of Israel and of Judah arose, and shouted . . . **(1 SAMUEL 17:52)**

All quotes taken from the 1917 edition of the Hebrew Bible, published by the Jewish Publication Society of America.

HYMAN S. BARAS, *a baseball fan and religious scholar, died in 2003. His son Larry Baras granted permission to reprint this essay, which first appeared on the Israel Baseball League Web site.*

MICHAEL WITTE